

RESTORING THE FALLEN BLUE SKY: MANAGEMENT ISSUES AND ENVIRONMENTAL LEGISLATION FOR LAKE SEVAN, ARMENIA

Douglas Lind and Lusine Taslakyan***

TABLE OF CONTENTS

INTRODUCTION.....	31
I. LIMNOLOGY OF LAKE SEVAN	33
A. <i>History of the Problem of Lake Sevan</i>	33
B. <i>Sevan Watershed</i>	37
1. Physical and Geographical Characteristics of the Sevan Catchment Basin.....	37
2. Anthropogenic Influences on the Hydroecological Processes in Lake Sevan.....	38
C. <i>Hydrology of Lake Sevan</i>	39
1. Water Balance	39
2. Thermal Regime.....	40
3. Dissolved Oxygen	42
4. Nitrogen and Phosphorus	43
D. <i>Hydrobiology of Lake Sevan</i>	44
1. Phytoplankton	45
2. Zooplankton	45
3. Macrophytes.....	46
4. Zoobenthos.....	46
5. Fish.....	48
E. <i>Suggestions on Rehabilitation of the Sevan Limnosystem</i>	49
II. LEGISLATION AND POLICY INITIATIVES OF LAKE SEVAN	51
A. <i>Soviet Attitudes Toward Nature and Environmental Law</i>	51
1. The Value of Nature from Marx to Stalin	51
2. Stalinism.....	53
3. Soviet Environmental Law.....	55
B. <i>Armenian Constitution and Environmental Laws</i>	57
1. Constitution of the Republic of Armenia	58

2.	Principles of Environmental Protection Legislation of the Republic of Armenia	59
3.	Law of the Republic of Armenia ‘About Nature Reserves’	60
4.	Law on Environmental Impact Expertise	62
5.	Law of the Republic of Armenia on Environmental Education and Upbringing of Population	63
C.	<i>International Agreements and Conventions</i>	65
1.	National Environmental Action Program (NEAP)	65
2.	Lake Sevan Action Program for the Restoration of the Ecological Balance of the Lake (LSAP)	66
3.	USAID	71
D.	<i>Armenian Laws Specific to Lake Sevan</i>	72
1.	Charter of Sevan National Park	72
2.	Regulations on Commercial Fishing in Lake Sevan	73
3.	Law of the Republic of Armenia on Lake Sevan	75
4.	Law on Approval of Overall and Annual Plans of Restoration, Preservation, Reproduction and Usage of Ecosystems of Lake Sevan	79
5.	Water Code of the Republic of Armenia	80
III.	ASSESSMENT OF LAWS AND MANAGEMENT PLANS FOR LAKE SEVAN	85
A.	<i>Statutory Interpretation</i>	86
B.	<i>Water Quantity</i>	88
C.	<i>Water Quality</i>	91
D.	<i>Management Issues</i>	96
E.	<i>Environmental Impact Assessment</i>	98
F.	<i>Public Participation and NGO Involvement in Environmental Decision-Making</i>	99
	CONCLUSION	102

“The giant blue mirror of the lake
spreads out like a piece of sky that has
descended on earth among the mountains.”

– Maxim Gorky

INTRODUCTION

Armenia is a small, landlocked country in the Southern Caucasus Mountains. It is one of the world’s oldest civilizations,¹ yet a very young country. It was formed as one of the Newly Independent States (NIS) following the 1991 breakup of the Soviet Union. Armenia’s landscape ranges from rugged, impassible volcanic peaks in the Caucasus that reach nearly 3,600 meters above sea level, to highly fertile land in the Ararat Valley, the principal agricultural region of the country. Lake Sevan, the “Heart of Armenia,”² at one time encompassed nearly five percent of the country’s surface area. Lake Sevan is one of the oldest, largest, and highest alpine lakes in the world. It is the lake heralded by Maxim Gorky as a glorious piece of fallen blue sky.³

The size, depth, and high mountain location of Lake Sevan has made it an important ecological and cultural focus for the people of Armenia over many centuries. Yet these features also turned the lake into one of the most misguided and ecologically catastrophic engineering follies of the twentieth century. Beginning in the 1930s, the government of the Soviet Union undertook a series of management decisions to divert a substantial quantity of Lake Sevan’s waters to the Hrazdan River for irrigation in the Ararat Valley and for hydroelectric power generation.⁴ The Soviet plan called for decreasing the lake’s surface area,

* Professor of Philosophy and Environmental Science, University of Idaho; Faculty Member, The National Judicial College; Member of the Missouri and Pennsylvania Bars

** Environmental Policy and Legal Advisor, Program on Institutional and Regulatory Strengthening of Water Management, Development Alternative, Inc., Yerevan, Armenia.

The authors are grateful to Elena Spinei for her comments, insight, and assistance in bringing this article to fruition.

¹ See, e.g., Armen L. Valesyan, *Armenia, in ENVIRONMENTAL RESOURCES AND CONSTRAINTS IN THE FORMER SOVIET REPUBLICS* 221, 221 (Philip R. Pryde ed., 1995).

² REPUBLIC OF ARMENIA, LAKE SEVAN ACTION PROGRAM 2 (1999) [hereinafter LSAP]; Benoit Laplante, Craig Meisner, and Hua Wang, *Environment as Cultural Heritage: The Armenian Diaspora’s Willingness to Pay to Protect Armenia’s Lake Sevan* 2 (World Bank Policy Research Working Paper 3520 2005) (Noting that Lake Sevan constitutes “a very major component of Armenia’s cultural heritage,” so much so that it is “often said... [to] define[] the people of Armenia.”).

³ See www.armenia-travel.com/eng/resorts2.html.

⁴ See LSAP, *supra* note 2, at 2; USAID, Armenia: Strengthening Sustainable Water Management for Enhanced Environmental Quality, available at <http://www.ardinc.com>; M.

thereby decreasing water loss from evaporation and increasing the amount available each year for agricultural and hydroelectric purposes.⁵ Water was taken from the lake at rates significantly above the natural inflow, which decreased its volume by over forty percent and lowered its level by roughly nineteen meters over a span of forty years.⁶ The lake's surface area has diminished from 1,416 square kilometers to about 1,240 square kilometers.⁷ This decrease in water level, together with increased pollution loads from point and non-point sources, has significantly destabilized Lake Sevan's hydrology and ecology, resulting in an accelerated eutrophication process (algae growth) and substantial adverse impacts on the lake and its basin's flora and fauna.⁸

Since the collapse of the Soviet Union, restoration of Lake Sevan has become a matter of high priority within the newly independent Armenia, and has drawn the interest of the international environmental community.⁹ Organizations outside Armenia, such as the United Nations, the World Bank, the Ramsar Convention, and USAID have brought international attention to the lake, adopting management plans and position statements designed to increase protection, conservation, and restoration of the lake. Armenia, in turn, has responded by enacting a number of environmental laws that bear upon management of the lake and its surrounding region, including a series of laws that address only Lake Sevan.

This article examines the ecological problems plaguing Lake Sevan as a result of the lake's decreased water level during the Soviet era and the legal efforts taken to address them. Part I presents an overview of the lake's

Meybeck, M. Akopian, & V. Andreassian, *What Happened to Lake Sevan?* [sic], available at <http://www.limnology.org/news/23sevan.html> [hereinafter *What Happened to Lake Sevan?*]. The desiccation plan implemented by the Soviet government originated in a book published in 1910 by an Armenian engineer. Soukias Manasserian, *The Vaporating Billions and the Stagnation of Russian Capital*, *id.* at 2.

⁵ See Valesyan, *supra* note 1, at 229; LSAP, *supra* note 2, at 3; *Environment as Cultural Heritage*, *supra* note 2, at 4; Hua Wang, Benoit Laplante, Xun Wu, and Craig Meisner, *Estimating Willingness-to-Pay with Random Valuation, An Application to Lake Sevan, Armenia* 12 (World Bank Policy Research Working Paper 3367 (2004)); *Lake Sevan: The Sevan Problem*, available at <http://www.aua.am/aua/research/ecrc/SoEnew/english/sevan/sevan/probl.htm>.

⁶ See Arevhat Grigoryan, *Sevan, A Reflection of Armenia's Ecological Problems*, available at <http://www.hetq.am/eng/ecology/0510-sevan.html>; REPUBLIC OF ARMENIA, NATIONAL ENVIRONMENTAL ACTION PROGRAM 10 (1999) [hereinafter NEAP]; Valesyan, *supra* note 1, at 229; LSAP, *supra* note 2, at 3; *Environment as Cultural Heritage*, *supra* note 2, at 4; *Estimating Willingness-to-Pay*, *supra* note 5, at 12.

⁷ The lake's surface area before the water was level lowered was 1416 square kilometers. LSAP, *supra* note 2, at 6. The mean depth was 41.3 meters, and the volume was 58.5 cubic kilometers. MINISTRY OF NATURE PROTECTION OF REPUBLIC OF ARMENIA, NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002 (2003), available at LakeNet, <http://www.worldlakes.org/lakedetails.asp?lakeid=8636>.

⁸ See LSAP, *supra* note 2, 17-19; *Environment as Cultural Heritage*, *supra* note 2, at 4.

⁹ See *infra* text accompanying notes 224-25, 286-91.

limnology, comparing its original natural conditions with those found in the current wake of the level lowering project. Part II canvasses the laws enacted over the years to address the Sevan problem. This review begins at the political source of the problem—the philosophy of Soviet Marxism, the Stalinist policy to transform nature, and the few legal initiatives taken near the end of the Soviet era to address water resource issues throughout the USSR. The article then covers the post-Soviet era during which the independent Republic of Armenia enacted laws designed to address the environment in general and Lake Sevan in particular. This section reviews the international agreements and action plans that hold significance for Sevan. Finally, Part III undertakes an assessment of the various laws and management plans that impact the lake's restoration and future health. The article concludes that while the laws and plans derive from well-meaning intent, there is little reason to expect meaningful restoration. So long as the Armenian economy remains depressed and dependent upon the exploitation of Sevan's dwindling resources, and until the laws affecting the lake's health become more pragmatic in approach and better endowed with enforcement provisions that are carried out with force, the lake's health will likely continue to decline.

I. LIMNOLOGY OF LAKE SEVAN

A. History of the Problem of Lake Sevan

Armenia is the smallest of the former republics of the U.S.S.R. Nestled between Turkey to the west, Georgia to the north, Azerbaijan to the east, and Iran to the south, the entire country covers only 29,740 square kilometers. The country's population of about 3.75 million people experienced relative prosperity during the Soviet era compared to the very difficult times that have accompanied its short independence.¹⁰ War with Azerbaijan during the early 1990s over the disputed Nagorno-Karabakh region lead to severe economic hardship and environmental degradation in the country. Currently, the borders

¹⁰ See, e.g., NATIONAL RESEARCH COUNCIL, SCIENCE AND TECHNOLOGY IN ARMENIA 5-6 (2004), available at <http://nap.edu/openbook/0309092787/html/R1.html> (discussing decline of Armenian economy following independence, with particular emphasis on reduction in economic base for scientific research); Interstate Oil and Gas Transport to Europe (INOGATE), INOGATE Umbrella Agreement: Republic of Armenia, available at http://www.inogate.org/html/countries/economy/armenia_ec.htm (noting that during Soviet era Armenia developed "sophisticated industrial sector" supplying USSR and other foreign markets with manufactured goods such as defense and space electronics, optics, textiles, machine building equipment, and chemicals. Armenia's GDP fell by 48% within its first year of independence, 1991-1992) (last visited Dec. 15, 2005). See generally U. S. Department of State, *Background Note: Armenia* 4 (2005), available at <http://www.state.gov/r/pa/ei/bgn/5275.htm> (discussing economic problems that have beset Armenia since independence).

with Azerbaijan and Turkey remain at least partially closed and each country has in place an economic blockade against Armenia.¹¹ Given its transitional economy and high rate of poverty, Armenia is unable to give environmental issues appropriate attention. Yet despite its economic difficulties, the country in its nascent independence has identified the restoration of Lake Sevan, its most critical natural resource, as its most pressing environmental concern.¹²

Lake Sevan, situated 1,916.2 meters above sea level, constitutes Armenia's primary water resource, giving the lake strategic importance, both geographically and politically. The lake's catchment basin comprises one-sixth of Armenia's total area, and the waters of the lake provide a significant amount of hydropower and irrigation to the croplands of the Ararat Valley.¹³ Lake Sevan is located in the Gegharkounik District, sixty kilometers north-east of Yerevan, the capital of Armenia. It is the largest lake in the Transcaucasus Region,¹⁴ which, along with Armenia, includes Georgia and Azerbaijan. Even today, with its reduced size and ecological vitality, the lake remains one of the greatest freshwater high-mountain lakes of Eurasia, and one of the largest and most significant high mountain lakes in the world.¹⁵

As noted above, the ecological destabilization of Lake Sevan resulted from a series of management decisions by the Soviet Government beginning in the 1930s.¹⁶ Before its water level was lowered, Lake Sevan had attracted researchers' attention due to its location, large volume of water (approximately 58.5 cubic kilometers), and valuable species of endemic fish.¹⁷ The lake also furnishes habitat for crayfish, nursery zones for several aquatic and amphibian species, and a home for several populations of migratory birds.¹⁸ Moreover, the lake serves as an important tourist destination and, for many centuries, has been

¹¹ See, e.g., U.S. Department of State, *Background Note: Armenia*, *supra* note 10, at 4 (noting economic and trade difficulties resulting from blockades); USAID, USAID/ARMENIA STRATEGIC PLAN 3 (2004), available at <http://www.usaid.gov/am/strategy.html>; *Science and Technology in Armenia*, *supra* note 10, at 59; Peaceful Treaty on Karabakh Conflict Makes Armenia a Transit Territory, Baku, April 7, 2003, at <http://www.bakutoday.net/view.php?d=3740> (citing World Bank and IMF reports suggesting Armenia's economy could improve significantly if Azerbaijan lifted its economic blockade); Azerbaijan Lifting Blockade of Armenia to Notably Increase Armenian Export, WB and IMF Experts Consider, Yerevan, April 5, 2003, at <http://news.artsakhworld.com/ArCNews/Eng/sel-s.php?id=11155&phrase=blockade>.

¹² LSAP, *supra* note 2, at 2.

¹³ REPUBLIC OF ARMENIA, LAKE SEVAN ENVIRONMENTAL ACTION PLAN, EXECUTIVE SUMMARY 3-4 (1998) [hereinafter LSAP – EXECUTIVE SUMMARY].

¹⁴ LakeNet, <http://www.worldlakes.org/lakedetails.asp?lakeid=8636>.

¹⁵ See *What Happened to Lake Sevan?* *supra* note 4, at 1-2; *The Greens Union of Armenia, AN EXAMINATION OF LAWS AFFECTING LAKE SEVAN 1* (2003), available at <http://groong.usc.edu/ro/ro-20030107.html>.

¹⁶ See *supra* text accompanying notes 4-8.

¹⁷ See, e.g., *What Happened to Lake Sevan?* *supra* note 4, at 1.

¹⁸ *Id.* at 3-4.

a cultural focus for Armenia's history, music, and poetry.¹⁹

The high location of Lake Sevan compared to the fertile but arid Ararat Valley, together with a lack of energy resources in Armenia, challenged Soviet engineers attempting to use the lake's water in order to aid the region's economic development. According to scientific estimates from the 1920s and 1930s, before the water level was lowered, the main reason for Lake Sevan's water expenditure was evaporation.²⁰ Approximately 1.15 billion cubic meters of water evaporated from the lake annually, amounting to eighty-five to ninety percent of the total inflowing water.²¹ To more effectively use the lake's water and fish resources, the Soviet managers thus devised a plan to preempt the evaporation process by substantially reducing the lake's surface area. The plan involved taking 1.025 billion cubic meters of water from the lake annually—650 million cubic meters for energy and 375 million cubic meters for irrigation.²²

The project began in 1933.²³ By the late 1950s, it had become clear that the plan for Lake Sevan's desiccation demanded radical correction.²⁴ Over a period of four decades beginning in 1933, water was taken from the lake for irrigation and hydropower generation at rates significantly above the natural inflow, lowering the water level by about nineteen meters.²⁵ The decrease in water level, accompanied by increased external pollution loads from human activities, greatly modified the size of the lake, its chemical composition, and its fauna and flora.²⁶ For example, the lowering of the lake led to the extinction of two lake-spawning subspecies of Sevan trout and caused nearly 10,000 hectares of wetland habitat important for several species of migrating birds to dry out.

¹⁹ See LSAP, *supra* note 2, at 2; Marshall I. Goldman, *Environmentalism and Nationalism: An Unlikely Twist in an Unlikely Direction in THE SOVIET ENVIRONMENT: PROBLEMS, POLICIES AND POLITICS* 1, 6 (John Massey Stewart ed., 1992); World Bank, *Measuring the Economic Value of Environmental Protection Projects: Methodology and Application to Armenia's Lake Sevan*, available at <http://www.econ.worldbank.org/view.php?topic=11&type=20&id=11802>; Lake Sevan: Geghard's Lake, *supra* note 15.

²⁰ See *What Happened to Lake Sevan?* *supra* note 4, at 2.

²¹ R.H. HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA (LAKE SEVAN YESTERDAY, TODAY) 8 (1994) [hereinafter HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA]; *What Happened to Lake Sevan?* *supra* note 4, at 2.

²² HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 8.

²³ See Grigoryan, *supra* note 6, at 1; NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 99; *What Happened to Lake Sevan?* *supra* note 4, at 2.

²⁴ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 9; *What Happened to Lake Sevan*, *supra* note 4, at 2; Lake Sevan Features, available at <http://www.grida.no/enrin/htmls/armenia/soe2000/eng/sevan/features.htm>.

²⁵ LSAP, *supra* note 2, at 2-3; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 4; Valesyan, *supra* note 1, at 229.

²⁶ See *Environment as Cultural Heritage*, *supra* note 2, at 4; *What Happened to Lake Sevan?* *supra* note 4, at 2-4.

The first indications of eutrophication in Lake Sevan were observed in 1964. Researchers noted rapid growth of blue-green algae, a phenomenon described as “water-blooming.”²⁷ Over time, the lake’s condition worsened. Studies found an oligotrophic-eutrophic succession occurring. This caused the lake’s metabolic processes to destabilize, leading to deterioration of the water quality.²⁸

Authorities in the then-Armenian SSR quickly recognized that the eutrophication and destabilization were the direct consequences, albeit unintended and unpredicted, of the lake-lowering project.²⁹ In the 1960s, a new plan was introduced to stabilize the water level of Lake Sevan at 1,897 meters above sea level, thereby inhibiting or even reversing the negative effects of the project.³⁰ Typical of Soviet environmental management, the method of stabilization was scientific and technocratic. Rather than taking the relatively simple but politically contentious step of reducing the amount of water taken from the lake for irrigation and hydropower generation, the Soviet managers chose to erect a water tunnel to divert 250 million cubic meters of water per year from the Arpa River into Lake Sevan.³¹ Construction of the Arpa-Sevan tunnel was completed in 1981.³² With the addition of water from the Arpa River, the lake level began to stabilize at about 1,897 meters above sea level, approximately nineteen meters below the original level.³³

Water releases from Lake Sevan for irrigation and energy have also decreased somewhat, at least during certain years. From 1986 through 1987, for example, the lake’s net water level increased slightly because of such reductions.³⁴ In other years, the releases have been markedly higher. From 1992 to 1995, hydropower releases peaked because the temporary closure of a nuclear power plant in the town of Metzamor caused an energy crisis³⁵ and

²⁷ N. Legovich, *Changes in the Qualitative Composition of Phytoplankton in Lake Sevan Due to Its Water Level Lowering*, 12 *BIOLOGICAL J. ARMENIA* 31-42 (1968).

²⁸ *Id.*

²⁹ See Lake Sevan, Features, *supra* note 24.

³⁰ LSAP, *supra* note 2, at 7; Lake Sevan – Features, *supra* note 24.

³¹ See Valerik Minasyan, HUMAN POVERTY SNAPSHOT IN THE REGIONS OF ARMENIA GEGHARKUNIK MARZ 4.1 (2004), available at http://www.gov.am/enversion/programms_9/ahrc/ahrc_mshtakan_gorc_9_7.htm; *What Happened to Lake Sevan?* *supra* note 4, at 2-3; LSAP, *supra* note 2, at 7; Lake Sevan, Features, *supra* note 24; *Lake Sevan: The Sevan Problem*, *supra* note 5.

³² Minasyan, *supra* note 31, at § 4.1; *What Happened to Lake Sevan?* *supra* note 4, at 3; *Lake Sevan: The Sevan Problem*, *supra* note 5.

³³ LSAP, *supra* note 2, at 7.

³⁴ See *id.*

³⁵ The only nuclear power plant in Armenia, the Metzamor facility was shut down in 1988 as a result of well-organized protests by environmentalists concerned about the plant’s safety. In 1994, the Government of Armenia chose to reopen the plant, despite safety concerns, in order to alleviate energy hardships resulting from the closure combined with Azerbaijan and Turkish blockades. See

because of the trade blockade imposed by Azerbaijan following the Nagorno-Karabakh conflict.³⁶ By 1996, following the reopening of the Metzamor nuclear facility, the maximum release allowed from the lake was set at 370 million cubic meters a year.³⁷

B. Sevan Watershed

1. Physical and Geographical Characteristics of the Sevan Catchment Basin

The catchment basin of Lake Sevan belongs to the basin of the River Araks, a large tectonic depression surrounded by dormant volcanic mountains.³⁸ The watershed is nearly 400 kilometers long.³⁹ Lake Sevan and its basin were formed 25,000 to 30,000 years ago.⁴⁰ The lake has two parts, Minor Sevan and Major Sevan, which differ by age and origin.⁴¹

Mountain ridges as high as 3,598 meters above sea level surround Lake Sevan.⁴² As a result, the lake is well protected against influences from outside its own 3,647 square kilometer basin. The catchment basin influences Sevan's system mainly through river flow.⁴³ The small, one to three ratio between the surface of the lake and the catchment area makes the lake especially sensitive to internal basin changes.⁴⁴ On the northern part, the watershed line is close to the lake, ranging from two to three kilometers away, and the slopes are steep. Elsewhere, the watershed extends thirty to forty kilometers and the slopes are relatively gentle.

Annual precipitation levels in Lake Sevan's basin range from 250 millimeters on the lake surface to 800 millimeters on some mountain slopes. The average annual precipitation within the basin is about 500 millimeters.⁴⁵

John M. Gleason, *The Decision to Reactivate a First-Generation Soviet Nuclear Power Plant: Conceptual and Decision-Analytic Frameworks*, 8 RISK 39 (1997); Tamara C. Gureghian, *Medzamor: Weighing the Reopening of Armenia's Unstable Nuclear Power Plant and the Duties of the International Community*, 5 VILL. ENV'T'L L.J. 163 (1994). The plant remains a safety concern. USAID/ARMENIA STRATEGIC PLAN, *supra* note 11, at 22.

³⁶ Library of Congress, A Country Study: Armenia, Topography and Drainage, available at [http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field\(DOCID+am0030\)](http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field(DOCID+am0030)).

³⁷ See *id.* at 7-8 (explaining that 300 million cubic meters were designated for irrigation, while 70 million cubic meters were set aside for energy production).

³⁸ *Id.*; LakeNet, *supra* note 14; Lake Sevan: Geghard's Lake, *supra* note 15.

³⁹ LSAP, *supra* note 2, at 4.

⁴⁰ *What Happened to Lake Sevan?* *supra* note 4, at 2.

⁴¹ Lake Sevan, Features, *supra* note 24.

⁴² See LSAP, *supra* note 2, at 4.

⁴³ LSAP, *supra* note 2, at 6; Lake Sevan: Geghard's Lake, *supra* note 15.

⁴⁴ *What Happened to Lake Sevan?* *supra* note 4, at 2; LakeNet, *supra* note 14.

⁴⁵ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 38.

Yearly distribution of the precipitation corresponds to the peculiarities of the lake basin's relief. Due to a concave relief, much precipitation falls on the mountain slopes of the catchment basin. The peculiarities of the basin's relief and rock composition facilitate substantial drainage of domestic and agricultural wastes through surface streams formed from thawing waters and precipitation inflow.⁴⁶

2. Anthropogenic Influences on the Hydroecological Processes in Lake Sevan

As noted, the catchment basin influences Lake Sevan's system basically through rivers. Twenty-eight rivers or streams flow into the lake.⁴⁷ Among the larger rivers, only the Gavaraget flows into Minor Sevan. The total annual flow of tributaries to Lake Sevan amounts to 986 million cubic meters,⁴⁸ which is three percent of the volume of the lake.⁴⁹ The only outflowing river is the Hrazdan River, which flows into the Araks River.⁵⁰ After the lowering of Sevan's level, the comparative value of natural inflow, as well as the comparative influence of the catchment basin on the lake, increased due to the decrease in the lake's volume from 58.5 cubic kilometers to 33.4 cubic kilometers.⁵¹ As a result, the lake became more vulnerable to the introduction of external nutrients.

Agricultural activities likely contribute significantly more to Lake Sevan's eutrophication than direct human consumption and industry combined.⁵² It is estimated that about thirty-three percent of the lake's phosphorus load and about seventy percent of its nitrogen load come from agriculture.⁵³ Beyond agriculture, untreated sewage is another significant source of pollutants for Lake Sevan. Nearly fifty industrial and municipal plants situated in Sevan's catchment basin release about 40,000 to 60,000 cubic meters of wastewater into the lake each day.⁵⁴ This significantly exceeds the total capacity of the six

⁴⁶ See LSAP, *supra* note 2, at 8-9, 16-17.

⁴⁷ See NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 99; Minasyan, *supra* note 31, at § 4.1; Lake Sevan: Geghard's Lake, *supra* note 15.

⁴⁸ See Araik Babayan, Susanna Hakobyan, Karen Jenderedjian, Siranush Muradyan, & Mikhail Voskanov, *Lake Basin Management Initiative, Experience and Lessons Learned Brief: Lake Sevan 4*, available at http://www.worldlakes.org/uploads/sevan_01Oct2004.pdf.

⁴⁹ A. Hovsepian and R. Hovhannisyanyan, *The Effect of the Catchment Basin on the Water Quality of Lake Sevan Tributaries*, INTERNATIONAL CONFERENCE ON LAKE SEVAN: PROBLEMS & STRATEGIES OF ACTION 98 (1996).

⁵⁰ See NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 99; Minasyan, *supra* note 31, at § 4.1; *What Happened to Lake Sevan?* *supra* note 4, at 2.

⁵¹ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 47.

⁵² LSAP, *supra* note 2, at 8.

⁵³ *Id.*

⁵⁴ R. Hovhannisyanyan, *Non-Point Source Pollution*, INTERNATIONAL CONFERENCE ON LAKE SEVAN: PROBLEMS & STRATEGIES OF ACTION 31 (1996).

biological refinement stations and twelve stations of preliminary purification that operate in the lake basin, which have a capacity of slightly less than 10,000 cubic meters. Thus, daily more than 40,000 cubic meters of unpurified wastewater flows into the lake and its rivers.

The increased inflow of nutrients into Lake Sevan, especially from agriculture, has thus intensified the lake's eutrophication process and decreased its water transparency.⁵⁵ Negative influences from soil erosion, atmospheric deposition, and external pollution loads stemming from domestic, industrial, and municipal activities in the lake basin have also deteriorated the lake's water quality.⁵⁶ Still, Lake Sevan remains internationally classified as a "mesotrophic" rather than a "eutrophic" lake.⁵⁷

C. Hydrology of Lake Sevan

1. Water Balance

The water balance of a lake is a net change in water volume per unit area per unit time. It is measured as a difference between the inflow rates from all sources (e.g., precipitation, surface influents, groundwater seepage, etc.) and all the loss rates (evapotranspiration, outflows, etc.).⁵⁸ The main sources of water inflow into Lake Sevan are rivers, atmospheric precipitation, and ground water.⁵⁹ Under the lake's original natural conditions, present before 1933, the main water loss mechanism was evaporation, which accounted for 1,136 million cubic meters per year.⁶⁰ Table 1 summarizes the water balance of Lake Sevan from 1927 to 2003. This water balance caused the lake's level to fluctuate by only thirty to sixty centimeters, and reflected a rather stable hydrological condition.⁶¹

⁵⁵ See LSAP, *supra* note 2, at 8.

⁵⁶ *Id.*

⁵⁷ *Id.*; see also International Lake Environment Committee, World Lakes Database, available at <http://www.ilec.or.jp/database/asi/dsasi039.html>.

⁵⁸ ROBERT WETZEL, LIMNOLOGY: LAKE AND RIVER ECOSYSTEMS 46-47 (3d ed. 2001).

⁵⁹ LSAP, *supra* note 2, at 6.

⁶⁰ Araik Babayan, et al., *Lake Basin Management Initiative, Experience and Lessons Learned Brief: Lake Sevan 4* (2004), available at http://www.worldlakes.org/uploads/sevan_01Oct2004.pdf.

⁶¹ *Id.* at 5.

Table 1. Lake Sevan Water Balance (in m³/year)⁶²

Components of balance	1927-1933	1949-1962	1970-1979	1984-1990	1992-1997	1998-2003
Surface inflow	811	669	774	990	1144	986
Precipitation	509	475	479	486	466	498
Underground inflow	31	48	56	81	65	76
Summary income	1351	1192	1309	1557	1675	1560
Surface outflow	42	1383	430	329	831	167
Evaporation	1136	1041	1039	1102	1081	1262
Underground outflow	84	26	9	9	15	20
Summary expenditure	1262	2450	1478	1440	1927	1431
Discrepancy	+89	-1258	-169	+117	-252	+129

Scientific studies of the dynamics of the water lowering in Lake Sevan have divided the desiccation process into five stages. In the first stage, from 1933 to 1940, the water level dropped sixty-five centimeters.⁶³ During the second stage, from 1941 to 1948, the water level dropped 2.5 meters.⁶⁴ Over the third stage, from 1949 to 1962, the water level dropped an additional thirteen meters.⁶⁵ In the fourth stage, from 1963 to 1981, the water level dropped 2.65 meters.⁶⁶ Finally, in the fifth stage, from 1982 to the present,⁶⁷ some stabilization was reached due to the Arpa-Sevan tunnel.⁶⁸ Across the five stages, the hydrological retention time (HRT) of Lake Sevan dropped substantially.⁶⁹ The HRT of Lake Sevan prior to the lowering was 44.3 years. During the first period of lowering from 1933 to 1940, the retention time fell to 40.7 years, and by the fifth stage, the HRT was reduced to 25 years.⁷⁰

⁶² *Id.* at 4.

⁶³ See HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 183.

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ *Id.*

⁶⁸ See LSAP, *supra* note 2, at 7 (explaining that Arpa-Sevan tunnel was completed in 1981 and diverts an average of 250 million cubic meters per year of water from Arpa River to Lake Sevan). The addition of Arpa River water stabilized Lake Sevan's level at roughly 1897 meters above sea level. *Id.*; Minasyan, *supra* note 31, at 4.1; *What Happened to Lake Sevan?* *supra* note 4, at 3; Lake Sevan, Features, *supra* note 24.

⁶⁹ Wisconsin Department of Natural Resources, Glossary of Lakes and Water Terms, at <http://www.dnr.state.wi.us/org/water/fhp/lakes/laketerm.htm> (last visited, March 7, 2006). Hydrological retention time refers to the average length of time water resides in a lake. It is calculated by dividing the volume of water passing through the lake annually by the overall lake volume. *Id.*

⁷⁰ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 199.

2. Thermal Regime

The thermal regime of Lake Sevan is a product of its high altitude, substantial depth, and intensive vertical mixing of water masses. The reduction in the lake's level and the decrease in its water volume led to significant changes in the temperature regime. Faster warming in spring and summer, and more rapid cooling in the fall were observed. Before the water level was lowered, the water began warming in May at an average temperature of 3.5 to 4.0 degrees Celsius, and ended in August at a high of eighteen to nineteen degrees Celsius.⁷¹ Under present conditions, warming starts before the end of April in a higher temperature range of 4.0 to 4.5 degrees Celsius, and reaches nineteen to twenty degrees Celsius by late July.⁷² The average temperature of the lake increased by two degrees Celsius.⁷³ Lake Sevan exhibits thermal stratification (layering) in summer due to the difference in water temperature from the bottom, where it is cooler, to the surface, which is warmer. When the lake freezes, an inverse stratification (cooler at the surface) is observed.⁷⁴ Figure 1 shows a cross section of a typical freshwater lake in summer. The epilimnion is the surface layer that is fully mixed. It is the warmest and, due to light penetration, photosynthesis can occur. The hypolimnion is the deep cool layer with low turbulence and insufficient light for photosynthesis.⁷⁵ Horizontally, a lake can also be divided into littoral and pelagic zones. The littoral zone is a near shore zone where light reaches the underlying sediments.⁷⁶ The free open region of the lake beyond the littoral zone is called the pelagic zone.⁷⁷

⁷¹ *Id.*

⁷² *Id.*

⁷³ See NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 100.

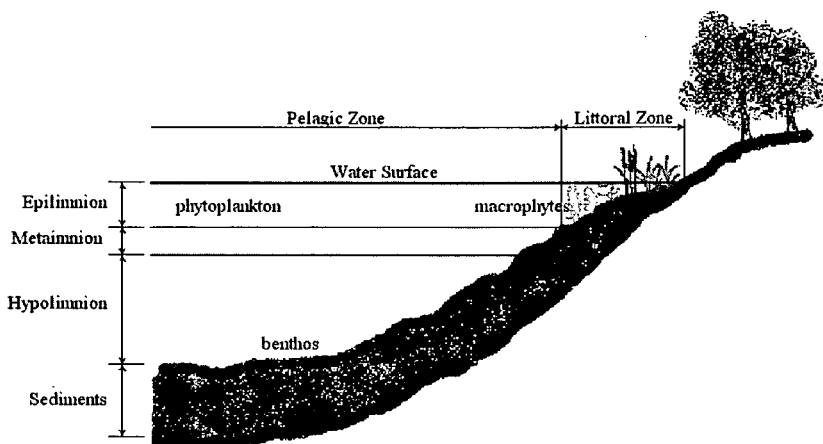
⁷⁴ K. SAVVAITOVA & T. PETR, FISH AND FISHERIES IN LAKE SEVAN, ARMENIA, AND IN SOME OTHER HIGH ALTITUDE LAKES OF CAUCASUS (FAO Fisheries Technical Papers, T385 (1999)), available at http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/X2614E/x2614e13.htm.

⁷⁵ JACOB KALFF, LIMNOLOGY: INLAND WATER ECOSYSTEMS 11 (2002).

⁷⁶ *Id.*

⁷⁷ *Id.*

Figure 1. Schematic Cross Section of a Thermally-Stratified Lake in Summer⁷⁸



3. Dissolved Oxygen

Dissolved Oxygen (DO) is one of the most important characteristics of lake ecosystems.⁷⁹ Oxygen enters aquatic systems by diffusion from air above the water surface and is produced within the system by photosynthesis.⁸⁰ Dissolved oxygen is consumed by aerobic respiration (bacteria, plants, animals) or direct chemical oxidation of dissolved organic matter.⁸¹ It also controls solubility and biological availability of many inorganic nutrients such as phosphorus, nitrogen, and sulfur.⁸² Changes in nutrient availability and distribution can lead to reduction in natural organism populations, i.e., those not capable of adjusting to new conditions, and growth in populations of organisms that utilize the new forms of nutrients.⁸³ The productivity of an entire lake can therefore be significantly modified as a result of long term changes in dissolved oxygen.⁸⁴ Dissolved oxygen concentrations vary horizontally and vertically, and depend on the temperature profile, nutrient loading, and organic productivity of the lake.⁸⁵

⁷⁸ *Id.*

⁷⁹ *Id.* at 226.

⁸⁰ WETZEL, *supra* note 58, at 151.

⁸¹ *Id.* at 153.

⁸² KALFF, *supra* note 75, at 226, 239, 246.

⁸³ WETZEL, *supra* note 58, at 151.

⁸⁴ *Id.*

⁸⁵ *Id.* at 155, 161.

The epilimnion dissolved oxygen concentrations in Lake Sevan vary between 6.23 to 11.08 milligrams per liter in the littoral zone, and 4.56 to 11.6 milligrams per liter in the pelagic zone.⁸⁶ Prior to the 1930s, the average minimum dissolved oxygen concentration never fell below 5.6 milligrams per liter.⁸⁷ Since then, the oxygen regime has changed along with the eutrophication of the lake. The average lake concentration of dissolved oxygen dropped from 8.0 to 3.0 milligrams per liter.⁸⁸ By the early 1970s, anaerobic conditions (zero oxygen) were observed near the bottom regions, resulting in the formation of hydrogen sulfide and methane.⁸⁹ The main causes of this oxygen deficit in Lake Sevan were the increased rates of mineralization of organic matter in the water and intensified biochemical and physico-chemical processes in the bottom sediments.

4. Nitrogen and Phosphorus

Nitrogen and phosphorus are the major nutrients affecting the productivity of fresh waters.⁹⁰ Maximum phytoplankton growth takes place when a certain nitrogen to phosphorus ratio is reached in the aquatic system. If the observed N:P ratio differs significantly from the optimal N:P ratio, the element in deficit plays a growth-limiting role.⁹¹ Before the water level was lowered, Lake Sevan exhibited a low concentration of mineral nitrogen and a high concentration of phosphorus, as it was decidedly oligotrophic (low in nutrients and productivity).⁹² Therefore, consonant with the discussion above, nitrogen was a growth limiting element prior to the 1930s. After the destabilization of the lake's ecosystem, along with the other limnological changes, the concentration of each of these biogenic substances changed significantly.

All forms of nitrogen have increased in Lake Sevan as a result of the lowered water level and municipal wastewater discharges.⁹³ The most dramatic increase was recorded during the third stage, from 1949 to 1962.⁹⁴ Hydro-chemical investigations from 1926 to 1933 indicated nitrogen concentrations in Sevan's water that were below the detection limit of the analytical method applied.⁹⁵ It was estimated that the total nitrogen concentration increased by

⁸⁶ See SAVVAITOVA, *supra* note 86.

⁸⁷ *Id.*

⁸⁸ NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 100.

⁸⁹ *Id.*

⁹⁰ KALFF, *supra* note 75, at 270.

⁹¹ *Id.* at 328-29.

⁹² See HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 220-21; SAVVAITOVA, *supra* note 74.

⁹³ See SAVVAITOVA, *supra* note 74.

⁹⁴ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 221.

⁹⁵ S. Lyatti, *Hydro-chemical Investigations of Lake Sevan and its Tributaries*, BUREAU OF HYDRO-METEOROLOGICAL INVESTIGATIONS IN LAKE SEVAN 7-8 (1929).

almost 30 times from 0.01 to 0.32 milligrams per liter during this stage.⁹⁶ During the period from 1976 to 1980, nitrogen concentrations in the lake water were about 0.11 to 0.27 milligrams per liter because of extensive growth of nitrogen-fixating blue-green algae and destruction of the macrophyte zone.⁹⁷ During the same period, near-bottom mineral nitrogen concentrations were 0.26 to 0.31 milligrams per liter.⁹⁸

Following the reduction in the water level at Sevan, eutrophication was accompanied by a decrease in phosphorus concentrations in the lake's water at a rate of 0.006 milligrams per liter per year.⁹⁹ From 1976 to 1980, the mineral phosphorus concentrations experienced a period of relative stabilization at 0.07 to 0.08 milligrams per liter, and, from 1982 to 1985, reached a period of low concentration, from 0.02 to 0.03 milligrams per liter.¹⁰⁰ It is likely that the intensive "blooming" of the water from 1976 to 1980 removed phosphorus from the lake's circulating system by trapping it in bottom sediments. From 1976 to 1980, the vertical distribution of mineral and total phosphorus in Lake Sevan's water showed an increase in phosphorus, from 0.08 to 0.2 milligrams per liter, near the lake's floor.¹⁰¹ From 1976 to 1985, the ratio between phosphorus at the bottom and phosphorus at the surface of the lake more than doubled, which is characteristic of eutrophic lakes.¹⁰² The overall phosphorus concentration reduction was twenty fold, from 0.32 to 0.017 milligrams per liter.¹⁰³ It has been suggested that co-precipitation of phosphorus with CaCO₃ might be responsible for phosphorus removal.¹⁰⁴

D. Hydrobiology of Lake Sevan

The lowering of the water level at Lake Sevan beginning in the 1930s led to a substantial decline in several flora and fauna species, most notably certain endemic trout subspecies and various waterfowl and water plants.¹⁰⁵ Changes in the lake's hydrobiology are apparent over a range of its principal biotic communities, such as phytoplankton, zooplankton, macrophytes, zoobenthos, and fish.

⁹⁶ NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 100.

⁹⁷ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 221.

⁹⁸ *Id.*

⁹⁹ *Id.* at 225.

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 100.

¹⁰⁴ See *What Happened to Lake Sevan?* *supra* note 4, at 4.

¹⁰⁵ See LSAP, *supra* note 2, at 17.

1. Phytoplankton

The species composition of phytoplankton at Lake Sevan changed significantly as a result of the lake's desiccation. A sharp increase in primary productivity of phytoplankton, which is considered one of the most important criteria of the eutrophication process, was noticed at Sevan in the early 1970s.¹⁰⁶ The increase in phytoplankton reached extremely high values, peaking at 7,000 kilocalories per square meter per year from 1975 to 1978, and then stabilizing at 3,000 kilocalories per square meter per year, which is three times the average values recorded at the end of the 1950s.¹⁰⁷ The lake's plankton primary production history thus reasonably divides into two distinct periods: high productivity from 1976 to 1978, and comparatively low productivity from 1981 to 1984.¹⁰⁸

Profound structural changes were also recorded in the lake's phytoplankton structure. In the oligotrophic phase of Lake Sevan, diatomic algae maintained quantitative superiority, particularly *Asterionella formosa* and *Stephnodiscus astraea*.¹⁰⁹ During eutrophication, the amount of diatomic algae diminished, while blue-green algae proliferated. In the most productive years, the blue-green algae accounted for about forty percent of the biomass.¹¹⁰ In this group, the dominant species which caused the blooming were *Anabaena flos-aquae* and *Anabaena lemmermanii*.¹¹¹ These species had been almost completely absent during the lake's oligotrophic phase.¹¹²

2. Zooplankton

The eutrophication of Lake Sevan brought significant changes in zooplankton species structure. The development of a zooplankton community in a limnosystem is closely connected with productivity of the autotrophic link. The increase in the zooplankton growth rate in Sevan peaked in 1976 at 15 kilocalories per cubic meter. Since then, zooplankton productivity has fallen off, stabilizing since at a level of four to six kilocalories per cubic meter since 1981.¹¹³

The increase in zooplankton productivity was accompanied by changes in species composition. For example, the number of *Rotatoria* increased sharply, the once abundant species of *Diatomus* disappeared entirely, and

¹⁰⁶ See HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 424.

¹⁰⁷ *Id.*

¹⁰⁸ *Id.* at 233.

¹⁰⁹ M. Vardanyan, *The Structure and Function of the Phytoplankton Symbiosis in the Eutrophication Process of Lake Sevan*, PROC. INT'L CONF. LAKE SEVAN: PROBS. & STRATEGIES OF ACTION 6 (1996).

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 249.

reproduction periods of *Daphnia* declined drastically.¹¹⁴ These dramatic changes in zooplankton productivity and the accompanying changes in species composition within Sevan over the last few decades were caused by a change in primary algal productivity.¹¹⁵

3. Macrophytes

The biomass of macrophytes, algae, and higher class water plants in Lake Sevan decreased because of significant changes in the lake's substrate distribution. Before the lake's water level was lowered, its littoral zone structure consisted of 15 to 18 percent silt, 22 to 25 percent sand, and approximately 60 percent cobbles and gravels.¹¹⁶ Since the lake level was lowered, the littoral area has increased by 50 percent, leading to a seven-fold increase in silt substrates in this zone. Cobble-gravel substrates in the lake, especially in Major Sevan, have completely dried out.¹¹⁷

Before the water level was lowered, Lake Sevan had a well developed macrophyte community that reached significant depths due to high water transparency. The transparent quality of the water provided a healthy habitat for phytoplankton benthic organisms, such as *Gammarus*, which are an important component in Sevan's fish food base. *Chara* species reached depths of 15 to 17 meters. The biomass of macrophytes in the littoral zone, six meters from the surface, was 6.5 to 20 kilograms per square meter, while at depths between six and eighteen meters it was 4.0 to 6.0 kilograms per square meter.¹¹⁸

The macrophyte habitat conditions in Sevan significantly deteriorated once the lowered water level decreased the water transparency due to on-shore turbulence of sand-silt sediments.¹¹⁹ At the present time, macrophytes are mostly developed in turbulence protected zones and bays, especially in Minor Sevan. Significant portions of the biomass at five meter depths consist of *Cladophora* and *Enteromorpha* species. In total, the biomass of macrophytes in Lake Sevan currently comprises about 35,000 to 50,000 tons.¹²⁰

4. Zoobenthos

The lowered water level in Sevan has also resulted in changes in its zoobenthos composition.¹²¹ A drastic decline in abundance of amphipods

¹¹⁴ *Id.* at 424.

¹¹⁵ *Id.* at 249.

¹¹⁶ S. SARKISYAN, PETROGRAPHIC-MINERALOGICAL INVESTIGATIONS OF LAKE SEVAN BASIN 129-44 (1962).

¹¹⁷ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 242.

¹¹⁸ *Id.* at 243.

¹¹⁹ *What Happened to Lake Sevan?* *supra* note 4, at 4.

¹²⁰ P. Gambaryan, *Distribution of Macrophytes in Lake Sevan*, LIMNOLOGY OF MOUNTAINOUS RESERVOIRS 55-56 (1984).

¹²¹ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 252.

(*Gammaridae*) was observed, while such species as *Trichoptera*, *Hirudinea*, and *Hydra* disappeared entirely from Sevan's benthofauna.¹²² Increased biomass of *Oligochaeta* and *Chironomidae* was attributed to the increase in area of silt substrates.¹²³

There is a close relationship between zoobenthos structure, biomass, and production, and the trophic level of the Lake Sevan ecosystem. Comparing the process of eutrophication from 1938 to 1948, Stages I and II, to that of 1975 to 1978, Stage IV, shows a six-fold increase in the biomass of benthos.¹²⁴ This resulted from a 33-fold increase in the biomass of *Chironomidae*, a 4.5-fold increase in the biomass of *Oligochaeta*, and a 3.1-fold increase in the biomass of *Mollusca*, which are mostly represented by detritofags and filtrators. Before the reduction of the lake level and from 1938 to 1948—the first years the lake was lowered—*Oligochaeta* and *Gammaridae* made up the largest portion of the biomass in the benthos, 36.2 and 34.6 percent, respectively.¹²⁵ In the period of maximum productivity of the lake, from 1975 to 1978, *Chironomidae* larvae made up the dominant portion of the biomass, approximately 70 percent, while *Oligochaete* became subdominant, making up only 26 percent of the biomass.¹²⁶ These changes in Sevan's zoobenthos structure are logical considering that some chironomids are able to survive hypolimnial oxygen deficit and high turbid substrates. A three-fold decrease in primary productivity of plankton in Lake Sevan from 1978 to 1983 and the resulting decrease in flow of organic matter to the bottom caused a decrease in production of macrobenthos at 20 meter depths, which is the lake's fish-feeding zone.¹²⁷

Given that many benthic species in Lake Sevan play an important role in fish nutrition, the changes in zoobenthos structure have impacted the lake's fish populations.¹²⁸ *Amphipodes* were the principal food for Sevan trout during the 1950s and 1960s, comprising 90 percent of their food supply.¹²⁹ By the 1980s, the importance of *Amphipodes* in the feeding of trout had decreased ten-fold due to destruction of the lake's trophic status. This change in trout feeding behavior resulted directly from the significant reduction in plankton and zoobenthos production caused by a decrease of primary production in 1978 and 1979.¹³⁰

¹²² *Id.*

¹²³ *Id.*

¹²⁴ *Id.*

¹²⁵ See SAVVAITOVA, *supra* note 74.

¹²⁶ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 253.

¹²⁷ *Id.*

¹²⁸ *Id.* at 258.

¹²⁹ *Id.*

¹³⁰ *Id.*

5. Fish

Lake Sevan has three endemic fish species (Sevan trout, Sevan khramulya and Sevan barbel), two species introduced in the 1920s (Lake Ladoga whitefish and Lake Chud whitefish), and one crossbred hybrid species (*Coregonus lavaretus sevanicus*).¹³¹ Sevan trout (*Salmo ischchan*) is represented by four subspecies: "Winter" Sevan trout (*Salmo ischchan ischchan*), Gegarkuni Sevan trout (*Salmo ischchan gegarkuni*), "Summer" Sevan trout (*Salmo ischchan aestivalis*), and Bodzhak Sevan trout (*Salmo ischchan danilewskii*). Sevan khramulya (*Varicorhinus capoeta sevangi*) has no subspecies in Lake Sevan. Sevan barbel (*Barbus lacerta goktchaicus*) is represented by three forms: lake form, transitional lake-river form, and river form.¹³²

Changes in Lake Sevan's water quantity and quality have negatively impacted its fisheries, both in quantity and composition of the fish community. The reduced water level caused natural spawning grounds to dry out in the 1940s, triggering a gradual decline in quantities of Sevan trout (*Salmo ischchan*).¹³³ After 1955, conditions became highly favorable for the reproduction of whitefish.¹³⁴ By 1965, whitefish amounted to 40 percent of the total fish catch in Sevan.¹³⁵ The share represented by Sevan trout (*Salmo ischchan*) fell to 28 percent, while the Sevan khramulya (*Varicorhinus capoeta sevangi*) fell to 32 percent. Prior to the introduction of whitefish and the drop in the lake's water level, trout accounted for roughly 60 percent of Sevan's official fish catch.¹³⁶ Due to the serious decline in the trout population, trout fishing became illegal in 1976.¹³⁷ Nevertheless, poaching in the river-spawning subspecies, summer bakhtak and gegarkouni, continues.¹³⁸ Due to the drop in the lake's level and the shrinking of its spawning beds, the spawning conditions for *Varicorhinus* also deteriorated, and its quantities have diminished. The population numbers of whitefish increased. However, by the 1980s, commercial fishing reduced the age of whitefish spawners which led to poor quality of eggs and low survival rates of juveniles. As a result the whitefish population also dropped.¹³⁹

At the present time, Lake Sevan still supports only two of the original four subspecies of the Sevan trout (*Salmo ischchan*): Gegarkuni Sevan trout and "Summer" Sevan trout.¹⁴⁰ The "Summer" Sevan is nearly extinct.¹⁴¹ The few

¹³¹ See SAVVAITOVA, *supra* note 74.

¹³² *Id.*

¹³³ Gabrielyan, *supra* note 80, at 105.

¹³⁴ SAVVAITOVA, *supra* note 74.

¹³⁵ See Gabrielyan, *supra* note 80, at 105.

¹³⁶ LSAP, *supra* note 2, at 18.

¹³⁷ *Id.* at 19.

¹³⁸ *Id.*

¹³⁹ See SAVVAITOVA, *supra* note 74; Gabrielyan, *supra* note 80, at 105.

¹⁴⁰ Gabrielyan, *supra* note 80, at 106.

¹⁴¹ *Id.*

remaining stocks of the subspecies are sustained largely through artificial hatching.¹⁴² While four trout hatcheries currently operate in the lake basin, all operate far below their design capacities.¹⁴³ Additional problems come from a shortage of brood fish and eggs while operational inadequacies at the hatcheries further complicate the situation.¹⁴⁴

E. *Suggestions on Rehabilitation of the Sevan Limnosystem*

Lake Sevan provides a critical source of drinking water for Armenia and neighboring countries, as well as a necessary habitat for valuable fish species.¹⁴⁵ In 1994, a comprehensive 478-page study by Dr. R.H. Hovhannisyan of the Institute of Hydroecology and Ichthyology (IHEI) of the National Academy of Sciences of Armenia detailed how the exploitation of the lake caused by the Soviet desiccation plan disrupted the drinking water supplies as well as the fishery qualities of the lake and its tributaries.¹⁴⁶ Dr. Hovhannisyan based his report on a thorough analysis of the available information covering the period from 1920 to 1990. Using the principles of modern limnology, Hovhannisyan studied the abiotic and biotic factors influencing Lake Sevan's eutrophication and conducted mathematical modeling of its plankton autotrophic link. He concluded that the eutrophication intensity of the lake needed to be slowed down, a result that could only be achieved by raising the lake's level a minimum of six meters, up to 1,903.5 meters above sea level.¹⁴⁷

According to Hovhannisyan, raising Lake Sevan's level by at least six meters would have several beneficial impacts on the lake's ecosystem.¹⁴⁸ These include an increase in the lake's thermostability, an improvement in the oxygen conditions in the off-bottom water layers, an increase in the period of temperature stratification and transparency, rehabilitation of the macrophyte zones, and a decrease in the lake's trophic status and heterotrophic production.¹⁴⁹ In addition, Hovhannisyan's study suggested that it is urgent to address the increased nutrient load into Lake Sevan from agriculture and other human activities.¹⁵⁰ Accordingly, he called for actions to reduce and prevent the flow of eutrophic and polluting substances from the catchment basin into the lake.¹⁵¹

¹⁴² LSAP, *supra* note 2, at 19.

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ See NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT IN ARMENIA IN 2002, *supra* note 7, at 99.

¹⁴⁶ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 434. *What Happened to Lake Sevan?* *supra* note 4, at 1.

¹⁴⁷ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 434.

¹⁴⁸ *What Happened to Lake Sevan?* *supra* note 4, at 1.

¹⁴⁹ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 437.

¹⁵⁰ *Id.* at 438.

¹⁵¹ *Id.*

The long-term study and calculations completed by Hovhannisyan make it clear that the most essential step toward restoring Lake Sevan's water quality is reversing the lake's desiccation by raising its water level a minimum of six meters. Accomplishing this task would require decreasing and regulating water withdrawals by strict legislative acts and increasing the amount of inflowing water, probably by diverting water from the Vorotan River into Lake Sevan.¹⁵² Hovhannisyan's study also identifies improving the water supply and irrigation systems in the Republic as necessary steps towards improved water quality in the lake.¹⁵³

Other studies have suggested that Lake Sevan's water quality can only be enhanced through preventive and mitigating activities that reduce pollution from both agricultural and domestic sources.¹⁵⁴ One suggested mitigating measure is the construction of sewage systems in the towns of Gavar, Martuni, and Vardenis, along with construction of wastewater treatment plants around the lake.¹⁵⁵ Rehabilitating and extending the wastewater collection network in those three towns and other nearby villages would likely reduce domestic pollution into Lake Sevan significantly, and thus has been identified as a high priority in terms of addressing water quality issues.¹⁵⁶

Hovhannisyan also considered it critical that careful planning be given to economic development throughout the Sevan catchment basin.¹⁵⁷ This includes agriculture and fisheries. In order to decrease the amount of nutrient inflow into the lake, farming methods and approaches must be reconsidered, including encouraging ecologically sustainable farming methods and implementing environmental awareness programs throughout the basin.¹⁵⁸ Likewise, fishery practices must be reconsidered for sustainability. Attaining or maintaining sustainable management of fisheries in Lake Sevan will require close cooperation with fishers and effective enforcement of regulations to prevent poaching. Greater public awareness of the value and sensitivity of the fishery resource is necessary.¹⁵⁹ Key actions identified for fishery rehabilitation in the lake include rehabilitation and construction of trout hatcheries and development of a crayfish fishery.¹⁶⁰ In sum, the proffered ideas for restoration of Lake Sevan span a broad range of resource management, pollution control, and economic measures. Yet above all others, as the "corner-stone" in all current

¹⁵² *Id.* at 336.

¹⁵³ *Id.*

¹⁵⁴ See LSAP, *supra* note 2, at 32.

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

¹⁵⁷ HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21, at 438.

¹⁵⁸ See LSAP, *supra* note 2, at 33.

¹⁵⁹ *Id.* at 35.

¹⁶⁰ *Id.*

discussions regarding the lake's rehabilitation stands Dr. Hovhannisyan's insistence that the lake level be raised a minimum of six meters.¹⁶¹

II. LEGISLATION AND POLICY INITIATIVES OF LAKE SEVAN

With the hindsight of seven decades, aided by today's far greater scientific understanding of the basic principles of ecology and limnology, the Soviet management plan to desiccate Lake Sevan appears short-sighted. As indicated in Section I, the plan's imprudence became apparent by the late 1950s, triggering modifications and even counter-plans, such as the Arpa-Sevan tunnel designed to quash the negative effects of the lowered water level.¹⁶²

Since gaining independence in 1991, Armenia has enacted a number of environmental laws, some of which have focused exclusively on restoring or protecting Lake Sevan.¹⁶³ Certain international organizations have also partnered with Armenia to develop plans or mechanisms for the lake's revitalization.¹⁶⁴ This section will examine the various Armenian laws and international programs that bear upon Sevan. It will first discuss Armenian environmental laws of general application insofar as they touch upon Lake Sevan. Next, it will review international action plans and treaties that address the lake. Finally, this part will consider Armenian laws with exclusive application to Lake Sevan. Before commencing this inquiry into the current status of the law, however, it is worth returning briefly to the Soviet era to canvass the attitudes toward nature and the legal framework of the USSR that allowed the Sevan deterioration to occur in the first place.

A. Soviet Attitudes Toward Nature and Environmental Law

1. The Value of Nature from Marx to Stalin

Soviet Marxism regarded nature to be of little value. Karl Marx had perceived human life as alienated from its original natural state of intimacy with nature.¹⁶⁵ This alienation was the product of capitalism and the institution of private property.¹⁶⁶ To Marx, communism offered a "genuine resolution of the conflict between man and nature"¹⁶⁷ by eliminating private property rights and

¹⁶¹ See *What Happened to Lake Sevan?* *supra* note 4, at 4. But see Karine Danielyan, *A Critical Moment for Lake Sevan* (2004), available at <http://www.hetq.am/eng/ecology/0409-sevan.html>.

¹⁶² See *supra* text accompanying notes 24-33.

¹⁶³ See *infra* text accompanying notes 363-447.

¹⁶⁴ See *infra* text accompanying notes 287-91, 304-48.

¹⁶⁵ See KARL MARX, *ECONOMIC & PHILOSOPHICAL MANUSCRIPTS OF 1844* 65, 74-77 (Martin Milligan trans ed., 1988).

¹⁶⁶ See *id.* at 75-81.

¹⁶⁷ *Id.* at 102.

creating a wholly new political structure. Yet the reconciliation he envisioned between humans and nature was fully anthropocentric. All aspects of the environment, “the air, virgin soil, natural meadows, etc.,” were merely things of “use-value,” that is, value strictly instrumental to human ends.¹⁶⁸ Frederick Engels agreed, stressing further that human exploitation of the natural environment can for the most part proceed unchecked.¹⁶⁹ In Engels’ view, potentially serious consequences that result from our efforts to subdue nature are forestalled by scientific and technological advancements. Nevertheless, he assumed a more conciliatory attitude than Marx toward the power of nature to overcome our efforts to dominate it completely.¹⁷⁰ He cautioned:

Let us not... flatter ourselves overmuch on account of our human conquest over nature. For each such conquest takes its revenge on us. Each of them, it is true, has in the first place the consequences on which we counted, but in the second and third places it has quite different, unforeseen effects which only too often cancel out the first.¹⁷¹

The Soviet Communist Party adopted a rational, scientific approach to nature.¹⁷² It sought to discover laws of nature that could satisfy scientific notions of objective truth, while promoting Communist ideology and national economic development.¹⁷³ Yet the Party’s concern for nature was fickle. It strove to transform society through industrialization and economic growth without concern for the environment.¹⁷⁴ The environmental policy it imposed on Soviet society was grounded firmly in the ideology of Marxism-Leninism, especially the dogmas of collective ownership and centralized economic

¹⁶⁸ See KARL MARX, *CAPITAL* 16 (Friedrich Engels ed., 1990); see also *id.* at 14 (noting that raw materials prior to extraction were mere “[c]ommodities”); see generally PHILIP R. PRYDE, *ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION* 185 (1991).

¹⁶⁹ See Frederick Engels, *Outlines of a Critique of Political Economy*, in MARX, *ECONOMIC AND PHILOSOPHICAL MANUSCRIPTS*, *supra* note 113, at 171, 192-193.

¹⁷⁰ FRIEDRICH ENGELS, *DIALECTICS OF NATURE* 291-92 (1946).

¹⁷¹ *Id.*

¹⁷² See, e.g., I. TIMEKIN, *PRIRODA, OBSHCHESTVO, ZAKON* 49 (1976); DOUGLAS R. WEINER, *MODELS OF NATURE: ECOLOGY, CONSERVATION AND CULTURAL REVOLUTION IN SOVIET RUSSIA* 121-31 (2000) [hereinafter WEINER, *MODELS OF NATURE*]; CHARLES E. ZIEGLER, *ENVIRONMENTAL POLICY IN THE USSR* 154-61 (1987).

¹⁷³ See Paul R. Josephson, *Soviet Scientists and the State: Politics, Ideology, and Fundamental Research from Stalin to Gorbachev*, in *THE POLITICS OF WESTERN SCIENCE* 103 (Margaret C. Jacob ed., 1992) (“The most important factor in the history of Soviet science was the imposition of Stalinist policies in the 1930s. This led to the ideologization of science and the belief that socialist science existed as distinct from bourgeois science.”).

¹⁷⁴ See ZIEGLER, *supra* note 172, at 161 (explaining that environmental protection is identified, both by Communist Party’s central leadership and by virtually all bureaucratic organizations, as a low priority); V.V. Zagladin, *Global’nye Problemy o Sotsialisl’nyi Progress Chelovechestva*, 4 *VOPROSY FILOSOFII* 94 (1983); see also ROGER MANSER, *FAILED TRANSITIONS: THE EASTERN EUROPEAN ECONOMY AND ENVIRONMENT SINCE THE FALL OF COMMUNISM* 16 (1993) (noting that in communist era contradiction between economic growth and environment left battle zones of ecological destruction).

planning.¹⁷⁵ From that ideology flowed a set of environmental corollaries—what one scholar has termed the principal Soviet ‘images’ of the natural environment: “[A] preoccupation with transforming nature, a devotion to blind industrial growth, and boundless confidence in the ability of science and technology to resolve any environmental problem....”¹⁷⁶

2. Stalinism

The Communist Party’s attitude as to nature achieved its highest point under Joseph Stalin. Stalin introduced the first of his five-year plans in 1928. The plan sought to achieve the most rapid industrialization possible¹⁷⁷ and raised the targets for the country’s agricultural collectivization campaign to a dizzying pace,¹⁷⁸ providing a political context where the exploitation of natural resources not only could be achieved with impunity but was in fact established as a priority.¹⁷⁹ Under what has since been termed the “Bolshevization of philosophy and science,”¹⁸⁰ the five-year plan reflected Stalin’s paradoxical disdain for theoretical science, on the one hand, coupled with an unbridled faith in applied (“home-grown practical”¹⁸¹) science, on the other.¹⁸²

¹⁷⁵ See ZIEGLER, *supra* note 172, at 154.

¹⁷⁶ *Id.* While there was certainly dissension, throughout most of the USSR’s history, the Soviet people generally ascribed to the Soviet political attitude toward nature. *Id.* That is, Soviet citizens generally accepted the belief that “[u]nder proper socialism, the scientific-technological revolution can be utilized to solve all major problems.” Zagladin, *Global’nye Problemy o Sotsialisl’nyi Progress Chelovechestva*, *supra* note 174, at 94. Thus, there was general confidence among the Soviet populace that socialism could fix most any environmental complications that may arise and that developments in science and technology would crack any barriers confronting such socialist solutions. E.V. KLESOVA, *PRIRODI I CHELOVEK* 22-29 (1979); Zagladin, *Global’nye Problemy o Sotsialisl’nyi Progress Chelovechestva*, *supra* note 174, at 94. See generally V.D. KOMAROV, *THE DESTRUCTION OF NATURE IN THE SOVIET UNION* (1977).

¹⁷⁷ PRYDE, *ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION*, *supra* note 168, at 17; Josephson, *supra* note 173, at 104 (“Under Stalin, new policies were introduced to harness science to the machine of industrialization.”).

¹⁷⁸ See WEINER, *supra* note 172, at 121 (discussing breakneck pace of collectivization campaign, typified by target of All-Union Central Executive Committee to increase Soviet grain harvest by 35% over period of first Five-Year Plan); see generally DONALD KELLEY, *THE ECONOMIC SUPERPOWERS AND THE ENVIRONMENT* (1976).

¹⁷⁹ See MARSHALL I. GOLDMAN, *THE SPOILS OF PROGRESS* (1972); see also PRYDE, *ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION*, *supra* note 168, at 149 (observing that under anti-preservation, utilitarian activities of the Stalin era such as logging in the Central Forest reserve and exotic game breeding at Askania-Nova were not only permitted but encouraged.”); WEINER, *supra* note 172, at 149 (noting that during first Five-Year Plan, resources were exploited with an intensity never before seen in Russia).

¹⁸⁰ See WEINER, *supra* note 172, at 130.

¹⁸¹ *Id.*

¹⁸² See Josephson, *supra* note 173, at 107-08.

Stalin determined what was “acceptable” science according to his “doctrine of the primacy of practice”¹⁸³—a standard holding that “all scientific doctrines had to accord with, if not justify, the specific social and economic policies of the [Soviet] regime.”¹⁸⁴ Theoretical science was unacceptable under this doctrine, for the natural laws scientists tended to posit typically assumed limitations on, among other things, agricultural productivity. Stalin refused to accept any natural limitations to the industrial and agricultural growth the USSR needed to meet the dramatic pace of economic development he had set in the five-year plan. On his account, practical, applied science allowed for the ambitious goals and agronomic advances he demanded.¹⁸⁵ In the process, nature became transformed in Soviet ideology. Unlike Marx, who crafted communism in part to reconcile the once harmonious interconnection between humans and nature, Stalin regarded nature as a hostile force likely to inflict great harm unless dominated and mastered.¹⁸⁶ “*The great transformation of nature*” became the “environmental” hallmark of Stalinism.¹⁸⁷ This statement embodied a program of exploitation and transformation, where the supposedly useless aspects of the natural environment were to be transformed, through practical science and engineering into serviceable commodities for the growth of agriculture and industry.¹⁸⁸

Within the context of the first five-year plan, the desiccation of Lake Sevan was perfectly understandable. Unharnessed nature was wasteful and inefficient. The Soviet engineers were not destroying a resource of great natural value. Rather, they were aiming to capture an enormous quantity of water left by nature to waste and loss of value through the chance process of evaporation. Soviet engineers sought to rectify this loss by preempting nature: diverting the water for beneficial hydroelectric and agricultural purposes before nature could waste it.¹⁸⁹

¹⁸³ See WEINER, *supra* note 172, at 233.

¹⁸⁴ *Id.*; see also *id.* at 130-31 (discussing Stalin’s preference for “practice,” by which he meant practical successes of Soviet economic and industrial development, over theoretical science); Josephson, *supra* note 173, at 108 (noting Stalin’s demand for applied research, i.e., rationalized, comprehensive, centralized plans for scientific research to contribute to growth of industrial production).

¹⁸⁵ See WEINER, *supra* note 172, at 130, 168, 232-33 (noting the near-mystical faith Stalin placed in the power of applied (i.e., ideologically driven) science to attain the goals and targets for growth set forth in the Five-Year Plan) *cf.* PRYDE, ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION, *supra* note 168, at 245 (stating that to an extent Stalin viewed nature as “merely a challenge for the engineering profession”).

¹⁸⁶ WEINER, *supra* note 172, at 168, 234-35; accord PRYDE, ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION, *supra* note 168, at 245 (Stalin saw nature as “an annoying obstacle that must be decisively defeated”).

¹⁸⁷ WEINER, *supra* note 172, at 169 (emphasis added).

¹⁸⁸ *Id.* at 168-69, 233-35.

¹⁸⁹ Lake Sevan was not the only major water transformation project undertaken by Soviet engineers during and after the Stalin years. Other major development and irrigation projects caused the water levels to decrease substantially in the Sea of Azov, the Aral Sea, Lake Issyk-Kul’, and in

3. Soviet Environmental Law

By the late 1950s, the Sevan project's failure was apparent, Stalin was dead, and the Soviet program to transform nature was beginning to fall into disrepute.¹⁹⁰ For the next three decades, the Soviet Government tried halfheartedly to reverse the negative impacts of the lowered water level without cutting into its economic benefits. The Arpa-Sevan tunnel was one solution. Environmental legislation enacted during the 1960s and 1970s provided regulatory frameworks under which water resources in the USSR, like Sevan, were to receive greater protection. Most significant were a national law, the Principles of Water Legislation of the U.S.S.R. and Union Republics (1970), certain provisions of the 1977 U.S.S.R. Constitution, and a law specific to Lake Sevan: the Charter of Sevan National Park, adopted in 1978.¹⁹¹

The most significant U.S.S.R. environmental law was, in theory, Principles of Water Legislation of the U.S.S.R. and Union Republics (1970),¹⁹² which was intended to protect water resources. This legislation stipulated that water resources should be accorded rational use and protected from pollution and depletion.¹⁹³ It also assured protection of water users' rights.¹⁹⁴ The Government became obligated under the law to manage water resources, protect them from pollution and depletion, establish standards of water quality and conservation, and use water resources efficiently.¹⁹⁵ The law did not require the state to assess charges for using water resources, but it did obligate users to use them rationally, improve the quality of the water used through treatment, and reduce sewage discharges.¹⁹⁶ Illegal removal of water resources in violation of approved water-use plans, pollution or obstruction of water resources, untreated

most major USSR rivers in Central Asia. E.g., Philip P. Micklin, *Desiccation of the Aral Sea: A Water Management Disaster in the Soviet Union*, 241 *SCIENCE* 1170 (1988). Fresh water diversion from the Don River, which flows into the Sea of Azov, made the Sea more saline, which in turn distorted the water ecosystem, see D. Tolmazin, *Black Sea – Dead Sea?* *NEW SCIENTIST* 767-69 (Dec. 6, 1979) (reducing its fishery catch by over 90 percent); V. Kametsev, *The Fish of our Table*, *LITERATURNYA GAZETA* 10 (Sept. 12, 1984). Lake Issyk-Kul' in Kirgizia, has followed a pattern very similar to Lake Sevan, as its water level has dropped substantially due to extensive diversion for irrigation. See BARBARA JANCAR, *ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION AND YUGOSLAVIA* 174 (1987). In the 1980s the Soviet Government's proposed solution to the desiccation of Lake Issyk-Kul' was to divert water into the lake from a nearby river by way of dams and a tunnel. *Id.* at 174-75. Dams and water-management projects that divert the north-flowing rivers in Siberia to productive use in industry and agriculture have also had a tremendous effect on the environment. PRYDE, *ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION*, *supra* note 168, at 82-83 (1972); see also DOUGLAS R. WEINER, *A LITTLE CORNER OF FREEDOM: RUSSIAN NATURE PROTECTION FROM STALIN TO GORBACHEV* 414-28 (1996).

¹⁹⁰ See *What Happened to Lake Sevan?* *supra* note 4, at 2.

¹⁹¹ See text accompanying notes 192-223, *infra*.

¹⁹² PHILLIP R. PRYDE, *CONSERVATION IN THE SOVIET UNION* (1972).

¹⁹³ See *id.* at 225, art. 1.

¹⁹⁴ *Id.*

¹⁹⁵ *Id.* art. 3.

¹⁹⁶ *Id.* art. 17.

waste discharges, and negligent use exposed the violator to administrative and criminal liability¹⁹⁷ and required "reimbursement of losses."¹⁹⁸

This is not to suggest that serious water pollution problems were avoided in the U.S.S.R. any more than in the United States during the same era. As in the United States, much evidence and information on water pollution was officially denied.¹⁹⁹ In the mid-1960s, most wastewater in the U.S.S.R. was left untreated.²⁰⁰ Industrial and agricultural users in general squandered the country's water resources cavalierly. Estimates suggest that Soviet industry used four to six times more water in production than was needed.²⁰¹ Major sources of industrial and agricultural water pollution included fertilized agriculture,²⁰² food processing,²⁰³ untreated sewage,²⁰⁴ thermal power stations,²⁰⁵ mining,²⁰⁶ and logging.²⁰⁷

Toxic chemicals also proved to be a significant water pollution problem in the Soviet Union. High concentrations of various chemicals were found in rivers,²⁰⁸ lakes,²⁰⁹ and seas²¹⁰ throughout the country.²¹¹ Polychlorinated biphenyls (PCBs) were found in lakes and rivers.²¹² High concentrations of DDT, phosphorous-organic substances (POS), and hexachlorocyclohexan (HCH) were detected in several major bodies of water including the Volga River²¹³ and Lake Issik-Kil (Kirghizia).²¹⁴ In addition, several river systems contained lead, boron, beryllium, and other chemical compounds.²¹⁵

¹⁹⁷ *Id.* art. 46.

¹⁹⁸ *Id.* art. 44.

¹⁹⁹ See B. KOMAROV, *THE DESTRUCTION OF NATURE IN THE SOVIET UNION* 33 (1980).

²⁰⁰ See PRYDE, *CONSERVATION IN THE SOVIET UNION*, *supra* note 192, at 138.

²⁰¹ GOLDMAN, *supra* note 179, at 110; see also J.M. KRAMER, *Prices and the Conservation of Natural Resources in the Soviet Union*, in 24 *SOVIET STUD.* 364-70 (1973).

²⁰² See K. Bush, *Environmental Problems in the USSR*, 11 *PROBS. OF COMMUNISM* 22 (1972).

²⁰³ KELLEY, *THE ECONOMIC SUPERPOWERS AND THE ENVIRONMENT*, *supra* note 178, at 80.

²⁰⁴ PRYDE, *CONSERVATION IN THE SOVIET UNION*, *supra* note 192, at 138.

²⁰⁵ *Id.* at 139.

²⁰⁶ Bush, *supra* note 202, at 25.

²⁰⁷ GOLDMAN, *THE SPOILS OF PROGRESS*, *supra* note 179, at 161-68; PRYDE, *CONSERVATION IN THE SOVIET UNION*, *supra* note 192, at 98-100.

²⁰⁸ See J. LAMOTHE, *Water Quality in the Soviet Union: A Review*, in *MED. INTELLIGENCE OFF., DEPT OF ARMY, OFF. OF SURGEON GEN.* 6-7 (1971).

²⁰⁹ PRYDE, *CONSERVATION IN THE SOVIET UNION*, *supra* note 192, at 139-50.

²¹⁰ GOLDMAN, *THE SPOILS OF PROGRESS*, *supra* note 179, at 228-29.

²¹¹ Bush, *supra* note 202, at 22.

²¹² KOMAROV, *THE DESTRUCTION OF NATURE IN THE SOVIET UNION*, *supra* note 176, at 33.

²¹³ See M. SHIPUNOV, *The Volga's Groans*, *SOVETSKAYA ROSSIYA* 4 (Nov. 18, 1981); see also PRYDE, *CONSERVATION IN THE SOVIET UNION*, *supra* note 192.

²¹⁴ See KOMAROV, *THE DESTRUCTION OF NATURE IN THE SOVIET UNION*, *supra* note 176, at 36.

²¹⁵ *Id.* at 41.

The 1977 U.S.S.R. Constitution provided further protection for water resources by providing that “waters... [were] the exclusive property of the state,”²¹⁶ that is, the common property of the Soviet people. The Constitution obligated the government to protect the Soviet people’s common property,²¹⁷ including assurance of “rational exploitation and conservation of natural resources.”²¹⁸ Mindful of the interests of future as well as present generations, the Constitution stated that the Soviet government should apply the best scientific practices for exploration, management, and conservation of the U.S.S.R.’s vast natural resources.²¹⁹

In 1978, the Soviet Union added a final legal provision affecting Lake Sevan, the Charter of Lake Sevan National Park. The Charter designated 150,100 hectares encompassing Lake Sevan as a protected USSR National Park.²²⁰ The designation included the lake and 24,800 hectares of dry land.²²¹ The park was to serve as an environmental research institution, controlling the conservation of the reproductive ecosystem and natural resources of Lake Sevan and its basin by regulating park activities.²²² The park designation marked a starting-point for international collaborations to conserve historic and cultural monuments within the Lake Sevan basin.²²³

B. *Armenian Constitution and Environmental Laws*

While the Soviet government, like its counterpart in the United States, commenced an environmental legal initiative in the 1960s and 1970s, and even chartered Sevan National Park, the Soviets did very little to counteract the negative effects on the Sevan watershed caused by the water lowering project begun in the 1930s. Since Armenia gained its independence in 1991, Lake Sevan has received far greater attention, both under Armenian law and under international policy initiatives.²²⁴ Armenia has started work on a new legal structure for environmental protection, updating and developing existing

²¹⁶ U.S.S.R. CONST. art. 11.

²¹⁷ *Id.* art. 10 (“the state protects socialist property and provides conditions for its growth.”).

²¹⁸ *Id.* art. 73.

²¹⁹ *Id.* art. 18.

In the interests of the present and future generations, the necessary steps are taken in the U.S.S.R. to protect and make scientific, rational use of the land and its mineral and water resources, and the plant and animal kingdoms, to preserve the purity of air and water, ensure reproduction of natural wealth, and improve the human environment.

Id.

²²⁰ *Sevan National Park, available at* <http://www.grida.no/enrin/biodiv/biodiv/national/armenia/proarea/snpv1.htm>.

²²¹ *Id.*

²²² *Id.*

²²³ *Id.*

²²⁴ See *infra* text accompanying notes 287-447.

environmental legislation, implementing corresponding policies, and integrating them into international environmental processes. The government has elevated the former low-level State Committee of Nature Protection to the much higher, cabinet-like status of "Ministry of Nature Protection." In addition, Armenia has become more involved in regional and global environmental movements and has ratified a number of significant conventions and agreements.²²⁵

The environmental laws enacted by the Armenian Parliament since 1991 include some that address Lake Sevan specifically and several that contain provisions bearing upon the lake's management and protection.²²⁶ Most significant among these environmental laws of general application are the Principles of Environmental Protection Legislation of the Republic of Armenia, enacted in 1991; the Law of the Republic of Armenia 'About Nature Reserves,' also enacted in 1991; the Law on Environmental Impact Expertise, enacted in 1995; and the Law on Ecological Education of Population, enacted in 2001. The Constitution of the Republic, adopted in 1995, also warrants mention for its recognition of the importance of environmental protection. We will consider each of these laws in turn.

1. Constitution of the Republic of Armenia

The Constitution of the Republic of Armenia sets forth the major principles of the country's obligatory environmental protection.²²⁷ The environmental component of the constitution was adopted in 1995 and states: "The state shall ensure the protection and reproduction of the environment and the rational utilization of natural resources."²²⁸

Apart from this Environmental Guarantee Clause, both the Armenian Constitution and the Republic's Principles of Legislation on Nature Protection ensure consideration of the environment through reference to international treaties. The Constitution provides that Armenia's international treaty obligations become national law once they are ratified.²²⁹

²²⁵ N. DARBINYAN & H. ASHIKYAN, THE ROLE OF ENVIRONMENTAL ENFORCEMENT IN THE REPUBLIC OF ARMENIA: STEPS TOWARD SUSTAINABLE DEVELOPMENT (2002).

²²⁶ See *infra* text accompanying notes 230-86, 363-479

²²⁷ ARMENIAN CONST. art. 10.

²²⁸ *Id.*

²²⁹ International treaties that have been ratified are a constituent part of the legal system of the Republic. If norms are provided in these treaties other than those provided by laws of the Republic, then the norms provided in the treaty shall prevail. International treaties that contradict the Constitution may be ratified after making a corresponding amendment to the Constitution.

Id. art. 6.

2. Principles of Environmental Protection Legislation of the Republic of Armenia

In July of 1991, two months before Armenia broke away from the U.S.S.R., the Republic's Supreme Soviet, or Parliament, passed the Principles of Environmental Protection Legislation of the Republic of Armenia. This act established an overall environmental protection policy and set forth a legislative framework for the subsequent enactment of separate laws concerning specific environmental management and natural resource matters. The act remains in force and retains its policy and structural significance.

Among its more significant aspects, the Principles of Environmental Protection Law sets forth a number of economic mechanisms to provide incentives or otherwise coerce compliance with environmental legislation. These economic mechanisms include charges for using natural resources, emitting pollutants, or otherwise impacting the environment within lawfully permissible limits;²³⁰ assessment of fines for violations of environmental legislation;²³¹ tax increases or other economic sanctions for failing to install new environmentally benign technologies;²³² extra taxes for using environmentally hazardous technologies;²³³ tax credits or other economic privileges for environmentally friendly manufacturing or other commercial conduct;²³⁴ a system for licensing unavoidable releases or discharges;²³⁵ compensation frameworks for damages caused to natural objects;²³⁶ and procedures to compel restoration of damaged environments.²³⁷

The Principles of Environmental Protection Law further declares that it is the government's responsibility to provide safe, healthy, and favorable natural conditions for the social, aesthetic, and cultural needs of the Armenian people.²³⁸ The law obligates the state environmental protection agencies to provide information to the citizenry about the Republic's environmental concerns.²³⁹ The people of Armenia also receive specific environmental rights, including the right to full and trustworthy information about environmental conditions; the right to full compensation for health problems caused by environmental pollution, accidents, or disasters; the right to live in a pure environment and receive compensation in case of environmental destruction; and the right to participate in the process of environmental law-making and implementation.²⁴⁰

²³⁰ PRINCIPLES OF ENVTL. PROTECTION LEGISLATION OF THE REPUBLIC OF ARMENIA, art. 5.

²³¹ *Id.*

²³² *Id.*

²³³ *Id.*

²³⁴ *Id.*

²³⁵ *Id.*

²³⁶ *Id.*

²³⁷ *Id.*

²³⁸ *Id.* art. 6.

²³⁹ *Id.* art. 10.

²⁴⁰ *Id.* art. 11.

Chapter 2 of the Principles of Environmental Protection Law outlines the main principles of environmental expertise. It also sets certain ecological requirements for undertaking any economic activities in the territory of the Republic of Armenia. The statutory system provides for appropriate environmental norms and standards, including: maximum allowable concentrations of pollutants in air, water and soil; maximum discharges of harmful materials; limitations on the use of chemicals harmful to the environment; and maximum amounts of chemicals that can be used in agriculture.²⁴¹

Chapter 3 sets forth basic principles for the protection of particular natural resources including soil,²⁴² water,²⁴³ forests and other plants²⁴⁴ and animals.²⁴⁵ The statute's article on water protection states:

Surface and ground waters are subject to protection from pollution and depletion. Water is used under condition to preserve the amount of water necessary for natural cycle, to ensure its microbiological and chemical clarity, and undisturbed aquatic plants and animals. Water use is regulated by the Water Code of the Republic of Armenia.²⁴⁶

This provision is important to the protection and restoration of Lake Sevan. It is critical to note first, that the article accords general protection against pollution and depletion of water resources. Second, it stipulates that water users are responsible for securing the water cycle, protecting water quality, and avoiding negative impacts on aquatic life. Finally, the article cross-references the Armenian Water Code as the controlling law for regulating water use.²⁴⁷

3. Law of the Republic of Armenia 'About Nature Reserves'

Enacted in late 1991, within the first few months of Armenia's independence, the Law of the Republic of Armenia 'About Nature Reserves' regulates the formation and preservation of nature reserves. The law sets forth several goals: "preservation and reproduction of nature standards and ecosystems; preservation of natural monuments; preservation of diversity of biological species; scientific research of natural phenomena; supervision over the state of the environment; [and] ecological education as well as use of natural objects for recreational and learning purposes in cases stipulated by law."²⁴⁸ The Law About Nature Reserves defines 'Nature Reserves' as:

²⁴¹ *Id.* art. 12.

²⁴² *Id.* art. 18.

²⁴³ *Id.* art. 20.

²⁴⁴ *Id.* art. 22.

²⁴⁵ *Id.* art. 23.

²⁴⁶ *Id.* art. 20.

²⁴⁷ See *infra* text accompanying notes 448-79.

²⁴⁸ Law of the Republic of Armenia: About Nature Reserves art. 2 (Arm.).

[T]hose allocated (in a manner stipulated by law) tracts of land with surface and subterranean waters, mineral resources, flora and fauna, as well as individual natural objects which are of special ecological, scientific, medicinal, cultural, [or] aesthetic value and which entirely or partially, for a time or forever are not subject to economic exploitation.²⁴⁹

Under the law, a nature reserves can be of international, national, or local significance.²⁵⁰ Each designated nature reserve is either a State Conservancy, National Park, State Preserve, or Natural Monument.²⁵¹ Article 10 of the Law About Nature Reserves defines a 'National Park' as "an area (of land or water) which incorporates ecosystems and objects of special ecological, historical, cultural and aesthetic value which, due to favorable conjunction of natural and artificial scenery, can be made use of for... recreational, historical, cultural, and scientific purposes."²⁵² Designated national parks are divided into zones based on each region's unique characteristics and functional purposes.²⁵³ All zones marked for "conservancy" are closed to economic exploitation.²⁵⁴ Under the Law, a national park has the status of an "establishment for environmental protection and research," and possesses the rights of a juridical person.²⁵⁵

The law further specifies the conditions attached to the regime of National Parks.²⁵⁶ The law contemplated adoption of specific regulations for preserving individual sections of a National Park, including conservancy, recreation, and beneficial use, taking into consideration its ecological, recreational, cultural, and aesthetic values. Within the area of a National Park, with the exception of areas designated for State conservancies, many activities are prohibited, including the construction of industrial buildings and facilities unrelated to the functioning of the park.²⁵⁷ Additionally, geological explorations or other extractive exploitation of mineral resources, felling of trees, introduction and acclimatization of new species of plants or animals, and any other activities that run counter to the aims and status of a National Park, are prohibited.²⁵⁸

²⁴⁹ *Id.* art. 3.

²⁵⁰ *Id.*

²⁵¹ *Id.*

²⁵² *Id.* art. 10.

²⁵³ *Id.*

²⁵⁴ *Id.*

²⁵⁵ *Id.*

²⁵⁶ *Id.* art. 11.

²⁵⁷ *Id.*

²⁵⁸ *Id.*

4. Law on Environmental Impact Expertise

Since the passage of the National Environmental Policy Act of 1969 (NEPA) in the United States,²⁵⁹ Environmental Impact Assessment (EIA) programs have become the international norm for ensuring that governments consider environmental impacts when making major decisions. Such programs have been promoted internationally as a way of assuring that the proponents of activities affecting the environment consider potential impacts and whether more sustainable alternatives exist. As described by the Council of the European Communities, Environmental Impact Assessments generally identify and assess the significant effects of a project on the environment. These assessments weigh the project's direct and indirect impacts on humans, other species, natural resources, and cultural heritage before the government renders a decision on its implementation.²⁶⁰

In 1995, Armenia adopted the Law on Environmental Impact Expertise (EIE), intended to introduce the EIA process into the Republic's decision-making.²⁶¹ The law stipulates that the "EIE is an obligatory state procedure aimed at predetermining, preventing or mitigating the negative impact of a concept or planned activity on human health, [the] environment, [and] economic and social development."²⁶² The operative criteria for EIA analysis includes "principles of scientific substantiation, legality, and transparency in decision making."²⁶³ The EIA establishes procedures for public notification of planned or proposed activities, including holding initial public hearings and issuing decisions on the expediency or screening of an EIA;²⁶⁴ consideration of the scope of the environmental impact of a planned activity, including second-stage public hearings;²⁶⁵ completion of authorized expert opinions on the activity,

²⁵⁹ 42 U.S.C. §§ 4321-4370(f) (1970).

²⁶⁰ Council of the European Communities, Council Directive of June 27, 1985 on the Assessment of the Effects of Certain Public and Private Projects on the Environment, at <http://europa.eu.int/comm/environment/eia/full-text/85337.htm>.

²⁶¹ See M. VARDANYAN, GUIDELINES ON PUBLIC PARTICIPATION IN ENVIRONMENTAL IMPACT ASSESSMENT (2000). Armenia is the only Transcaucasian country to have ratified the convention of EIA adopted in Espo, Finland in 1991. *Id.* Armenia's ratification came in May 1996. *Id.* In late 1997, a Commission was established in Armenia for developing the provisions of the Convention on EIA in a transboundary context. *Id.* As of 2000, implementation of the provisions had yet to begin. *Id.*

²⁶² Law on Environmental Impact Expertise art. 2 (1995) (Arm.). This act is also known as the Armenian Environmental Impact Assessment Act. See Victoria Ter-Nikoghosyan, *Development and Enforcement of New Armenian Environmental Protection Legislation: Problems and Solutions*, in PROCEEDINGS OF THE FOURTH INTERNATIONAL CONFERENCE ON ENVIRONMENTAL COMPLIANCE AND ENFORCEMENT 5-9 (1996), available at <http://www.inece.org/publicationlist.html>.

²⁶³ L. ON ENVTL. IMPACT EXPERTISE art. 2 (1995) (Arm.).

²⁶⁴ *Id.* art. 6, 8.

²⁶⁵ *Id.* art. 8.

including an opportunity for third-stage public hearings;²⁶⁶ and final decision-making and issuance of the expert opinion(s).²⁶⁷

The Law on EIE specifies spheres of planned activities and concepts subject to obligatory EIA procedures.²⁶⁸ Planned activities and industries subject to Environmental Impact Assessments include energy production, the mining industry, the chemical industry, construction, metallurgy, the wood-processing industry, municipal services, agriculture, and forestry.²⁶⁹ Water supply sector activities that are subject to EIA preparation include construction of reservoirs and strongholds, dams, big canals, pumps and other water supply facilities, and withdrawal of underground waters.²⁷⁰ Threshold values of planned activities are to be determined by the Armenian government.²⁷¹ In addition, the Law on EIE prohibits any planned activity subject to the EIA procedures without positive expert opinion²⁷² and specifies an appeal procedure to settle disputes that arise out of the EIA requirements.²⁷³

5. Law of the Republic of Armenia on Environmental Education and Upbringing of Population

In November of 2001, Armenia enacted the Law on Environmental Education and Upbringing of Population. The law establishes environmental education as a national priority and sets forth a number of educational policy objectives. Generally, the law aims to provide the Armenian populace with “continuous, comprehensive, unified ecological knowledge”²⁷⁴ and to “promote development of ecological upbringing and culture, [and] harmonization of interrelations between people, society and environment.”²⁷⁵ More specifically, the law declares that every citizen of Armenia has the right to receive an ecological education.²⁷⁶ Environmental education is to be provided at every educational level, from preschool through postgraduate training, according to national educational standards.²⁷⁷ The law envisions that this educational agenda will ensure that every Armenian citizen has access to a minimum level of necessary ecological knowledge. It further encourages ecological education in all national environmental programs and calls upon the national government

²⁶⁶ *Id.* art. 10.

²⁶⁷ *Id.* art. 11.

²⁶⁸ *Id.* art. 4.

²⁶⁹ *Id.*

²⁷⁰ *Id.*

²⁷¹ *Id.*

²⁷² *Id.* art. 12.

²⁷³ *Id.* art. 21.

²⁷⁴ Law on Environmental Education and Upbringing of Population art. 3(a) (Arm.).

²⁷⁵ *Id.* art. 3(b).

²⁷⁶ *Id.* art. 12.

²⁷⁷ *Id.* art. 7.

to develop partnerships with existing informational and educational institutions.²⁷⁸ Finally, the law envisions an ecological education infrastructure to complement the government's efforts to address issues of environmental protection.²⁷⁹

The Environmental Education Law places principal responsibility for development of its ecological education program on the Armenian national government.²⁸⁰ Beyond the responsibilities just stated, the government is charged with several additional responsibilities. These include developing the infrastructure of continuous ecological education; participating in international ecological educational programs; drafting regulations for licensing educational institutions; preparing and training ecologists, scientists, teachers, and state employees in ecological education; and providing informational and scientific-methodological support for the system of continuous ecological education.²⁸¹

Despite its centralized structure, the Environmental Education Law encourages involvement by citizens and nongovernmental organizations (NGOs).²⁸² NGOs are specifically invited to participate in the development of the Republic's unified ecological education programs.²⁸³ Citizens and NGOs are given opportunities to suggest ways to improve or implement the national policy of ecological education, to participate in competitions for designing projects on ecological education, and to take part in planning and developing projects of international cooperation in environmental education.²⁸⁴ To the extent necessary to participate in the educational process, licensed NGOs and citizens can apply for ecological information from the government.²⁸⁵

Finally, the Environmental Education Law reduces the Armenian government's central role in the Republic's eco-education process in one further respect, a major concession to the international environmental community. The law stipulates that if any international agreement to which the Republic of Armenia is committed contains provisions or norms contrary to those identified in the Environmental Education Law itself, the norms of the international agreement will control.²⁸⁶ To the consideration of such international agreements we now turn.

²⁷⁸ *Id.*

²⁷⁹ *Id.* art. 4

²⁸⁰ *Id.* art. 10.

²⁸¹ *Id.*

²⁸² *Id.* art. 8, 12.

²⁸³ See *id.* art. 8 ("Ecological education in the Republic of Armenia is carried out according to unified national programs, which are being developed by authorized government bodies, as well as by nongovernmental organizations.").

²⁸⁴ *Id.* art. 12 (explaining that citizens and NGOs wishing to participate in any of these aspects of ecological education must secure a government-issued license. Requirements for receiving a license are set according to legislative regulations, consistent with national standards for ecological education).

²⁸⁵ *Id.*

²⁸⁶ *Id.* art. 13.

C. International Agreements and Conventions

Armenia is a signatory to more than ten international environmental treaties, agreements, and conventions.²⁸⁷ These include major agreements affecting Lake Sevan, particularly the Ramsar Convention on Wetlands²⁸⁸ and the Aarhus Convention.²⁸⁹ Through the Ramsar Convention, the Lake Sevan basin received international designation as a “Wetland of International Importance.”²⁹⁰ The most important international initiatives impacting Sevan, however, are two Action Programs underwritten by the World Bank and developed by a group of European countries working with the Armenian government.²⁹¹ After addressing these two Action Programs—the Republic of Armenia National Environmental Action Program (NEAP) and the Republic of Armenia Lake Sevan Action Program (LSAP)—the USAID water management program for Armenia will be considered.

1. National Environmental Action Program (NEAP)

A consortium of European nations and the World Bank supported the Ministry of Nature Protection of Armenia in preparing the first National Environmental Action Program (NEAP) for Armenia in 1999.²⁹² NEAP addresses several aspects of the Armenian environment, including land use, water resources, waste management, forestry, and biodiversity. Key areas of the Action Program are policy and program development, legal and regulatory reforms, institutional strengthening and capacity building, priority investment activities, and environmental awareness and education.²⁹³

²⁸⁷ DARBINYAN, *supra* note 225, at 136.

²⁸⁸ The Convention on Wetlands of International Importance especially as Waterfowl Habitat, signed in Ramsar, Iran in 1971, and commonly known as the *Ramsar Convention*, is an intergovernmental treaty which provides the framework for international cooperation and national activities for the conservation of wetlands and their resources. *See Ramsar Convention on Wetlands*, Feb. 2, 1971, available at <http://www.ramsar.org/>.

²⁸⁹ *See* Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, June 25, 1998, available at <http://www.unece.org/env/pp/documents/cep43e.pdf>. This convention is popularly known as the Aarhus Convention, based on its drafting in the Danish city of Aarhus in June 1998. *Id.* The convention aims to give voice to ordinary citizens in public decision-making that affects the environment. *Id.* It came into force on October 30, 2000, when Armenia and Estonia ratified it, giving it the requisite number of countries for adoption. *Id.*

²⁹⁰ *See Ramsar Convention on Wetlands*, *supra* note 288, available at http://www.ramsar.org/profiles_armenia.htm.

²⁹¹ *See* NEAP, *supra* note 6; LSAP, *supra* note 2; COUNTRY INCEPTION REPORT: ARMENIA, *supra* note 10, at 4-8 (discussing NEAPs in general and Armenia NEAP in particular).

²⁹² *See* NEAP, *supra* note 6.

²⁹³ *Id.* at xiii-xvii; COUNTRY INCEPTION REPORT: ARMENIA, *supra* note 10, at 5.

Specifically relating to water, NEAP envisions activities leading to development of an Integrated Water Resources Master Plan, meant to include a framework of legislative and administrative policy,²⁹⁴ and a National Water Supply and Wastewater Treatment Policy Plan, including assessment of present performance and development of a long-term plan for the water sector.²⁹⁵ NEAP calls for significant revision of Armenia's environmental legal framework as it affects, among other things, water quality protection.²⁹⁶ The legal reforms recommended include the development of a National Protected Area System.²⁹⁷ Under this recommendation, Armenia would review its existing laws regarding protected areas, develop a legal basis for protected area demarcation and gazettelement, and commence the design and implementation of an integrated system of protected area planning and zoning.²⁹⁸ NEAP further encourages significant "Institutional Strengthening and Capacity Building," including the strengthening of the Armenian Ministry of Nature Protection and the country's environmental monitoring and enforcement agencies.²⁹⁹ It also calls for the establishment of a National Water Management Board that, among other things, would help facilitate institutional support for water supply and wastewater treatment enterprises.³⁰⁰ Recommended "Priority Investment Activities" include the creation of integrated watershed and land management programs and improvement in water supply services and wastewater treatment.³⁰¹

Environmental awareness and education also receive substantial attention in NEAP. The Action Program advises creation of a National Communication Program for Water Resources Management, along with meaningful Republic-wide efforts in environmental education.³⁰² In furtherance of environmental education, NEAP suggests creation of an Environmental Awareness Media Fund and an Environmental Awareness Nongovernmental Organization Fund.³⁰³

2. Lake Sevan Action Program for the Restoration of the Ecological Balance of the Lake (LSAP)

Like NEAP, the Lake Sevan Action Program (LSAP) was prepared by the Armenian Ministry of Nature Protection together with the World Bank and a group of European countries. LSAP development was financed principally through a grant from the World Bank's Institutional Development Fund (IDF).

²⁹⁴ NEAP, *supra* note 6, at 34-35.

²⁹⁵ *Id.* at 35.

²⁹⁶ *See id.* at 37; COUNTRY INCEPTION REPORT: ARMENIA, *supra* note 10, at 7-8.

²⁹⁷ NEAP, *supra* note 6, at 38.

²⁹⁸ *Id.*

²⁹⁹ *Id.* at 38-39; COUNTRY INCEPTION REPORT: ARMENIA, *supra* note 10, at 6.

³⁰⁰ NEAP, *supra* note 6, at 40.

³⁰¹ *Id.* at 42-45.

³⁰² *Id.* at 45-46.

³⁰³ *Id.* at 47.

It received additional support from the United Nation's Food and Agricultural Organization (FAO) and grants from the governments of Finland, the Netherlands, Sweden, and Switzerland.³⁰⁴ The Action Program was developed from 1996 to 1998.³⁰⁵

The vision of LSAP is to restore Lake Sevan's natural ecosystem while taking into account the lake's many uses.³⁰⁶ The Action Program presents an integrated set of actions designed to raise the water level of the lake to improve its water quality and protect the biodiversity of the basin.³⁰⁷ The LSAP Report supports establishment of a Lake Sevan Commission as well as policy measures and instruments, including legal reforms, integrated policy and planning activities, increased water quantity, improved water quality, protection of biodiversity and national parks, enhancement of fisheries, applied research, and environmental awareness.³⁰⁸

LSAP recommends that its program activities be implemented in a phased manner.³⁰⁹ The Action Program divides its technical assistance and capital investment activities into four distinct project phases. Phase I includes projects considered necessary prerequisites to a successful implementation of the Program.³¹⁰ Phase II covers projects incorporated into ongoing programs at a limited cost.³¹¹ Phase III recommends low-to-medium cost projects that are prerequisites to more substantive development programs.³¹² Phase VI envisions major investment projects.³¹³ Activities proposed for Phase I include establishment of a regulatory commission for Lake Sevan, consolidation of all laws and regulations addressing the lake and Lake Sevan National Park, strengthening legal and regulatory enforcement, and preparation of several plans, including a water resources master plan for the lake, a Sevan-region land use and biodiversity plan, and an industrial pollution management plan.³¹⁴

In an effort to eliminate inconsistencies and discrepancies between laws and to create an efficient legal basis for integrated management of Lake Sevan, LSAP proposed that all laws related to the lake be consolidated into one Lake Sevan Law.³¹⁵ Beyond declaring that the lake needs protection, the proposed law would set forth specific strategic and policy objectives for lake rehabilitation, designate responsibility for rehabilitation and program

³⁰⁴ LSAP, *supra* note 2, at 20.

³⁰⁵ LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 5.

³⁰⁶ LSAP, *supra* note 2, at xi.

³⁰⁷ *Id.*

³⁰⁸ *Id.* at 26.

³⁰⁹ *Id.* at xi-xii, 23, 37, 42-43; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 8-11.

³¹⁰ LSAP, *supra* note 2, at xi, 37, 42; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 8-9.

³¹¹ LSAP, *supra* note 2, at xi-xii, 37, 42; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 9.

³¹² LSAP, *supra* note 2, at xii, 37, 43; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 10.

³¹³ LSAP, *supra* note 2, at xii, 23, 37, 43; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 11.

³¹⁴ LSAP, *supra* note 2, at xi.

³¹⁵ *Id.* at 27.

implementation to the proposed Lake Sevan Commission, and specify limits for maximum allowable annual discharges, emergency discharge rules, and water user fees.³¹⁶ Moreover, the law would establish enforcement procedures and mechanisms, determine procedures for lake management decision-making, and ensure meaningful stakeholder participation in management of the lake.³¹⁷

In addition to enactment of a comprehensive Lake Sevan Law, LSAP also recommends revision of Armenia's legal framework for biodiversity and protected area management.³¹⁸ The Action Program envisions the establishment of a legal committee for protected area and biodiversity management with representation from relevant government ministries and institutes as well as stakeholder groups.³¹⁹

LSAP's vision of "integrated" management takes into account all stakeholder groups as well as Lake Sevan's ecological functions.³²⁰ This is reflected in the Action Program's proposed Integrated Water Resources Master Plan for the Lake Sevan Basin.³²¹ Such an Integrated Master Plan would attempt to interweave the concerns and interests of all users—domestic, industrial, agricultural, and energy-related water users alike, with sensitive attention to the lake's ecological functions.³²² It would establish criteria and standards for, among other things, water withdrawal limitations, emergency releases, and incentives for water conservation and pollution reduction.³²³

The Land Use and Biodiversity Plan recommended by LSAP would establish a framework for biodiversity conservation and land use management in the Lake Sevan basin.³²⁴ The plan would stipulate rules for land use and promote sustainable land management.³²⁵ In relation to agriculture, it would introduce ecologically sustainable farming methods and advocate adoption of a Code of Good Agricultural Practice throughout the basin.³²⁶ It would also recommend specific limitations and monitoring of economic activities.³²⁷

In anticipation of economic recovery in Armenia, LSAP further recommends immediate adoption of an Industrial Pollution Management Plan to protect against industrial pollution when industrial activities in the Sevan basin begin to recover.³²⁸ The Action Program recommends that this plan address

³¹⁶ *Id.*

³¹⁷ *Id.*

³¹⁸ *Id.* at 28.

³¹⁹ *Id.* at 28, 33-34.

³²⁰ *Id.* at 28-29, 38.

³²¹ *Id.* at 29.

³²² *Id.*

³²³ *Id.*

³²⁴ *Id.*

³²⁵ *Id.*

³²⁶ *Id.*

³²⁷ *Id.*

³²⁸ *Id.* at 29-30 (following the collapse of the Soviet Union, most industrial entities in the Sevan basin ceased operation).

monitoring, enforcement, and incentive structures for industrial redevelopment in the basin as the country's economic recovery progresses.³²⁹ For this and the other plans mentioned above, LSAP encourages that technical advice for plan development and implementation come from international sources as well as national governmental and nongovernmental stakeholder groups.³³⁰

For Phase II, the LSAP Report envisions a number of primarily educational and support activities.³³¹ Among the most important are a Republic-wide environmental awareness and public education campaign, the introduction and dissemination of information on ecologically sustainable farming methods, and the development of support procedures and incentives for ecological farming and watershed management.³³² The Action Program also recommends the establishment of restricted biodiversity reserves.³³³

Perhaps the most ambitious activity proposed for Phase II is on-farm introduction of ecologically sustainable farming methods, known collectively as "Good Agricultural Practice."³³⁴ The goal of this endeavor is to "support field-level demonstration of ecologically sustainable farming methods on individual farms and on pilot watersheds within the basin."³³⁵ This would specifically include assisting local farmers and agricultural businesses in developing farm and watershed management plans, providing practical training, and assisting in the construction of field trails, monitoring structures, and on-farm manure and urine storage facilities.³³⁶ The drafters of LSAP envisioned that these activities would be pursued through agricultural and rural development projects supported by international organizations in cooperation with the Armenian government.²²⁴

Another significant LSAP objective for Phase II is the combined strengthening of Lake Sevan National Park's management and the establishment of "restricted biodiversity reserves" to protect certain areas within the Sevan basin that support especially rare, relict, and endemic flora and plant formations.³³⁷ The general goal of these combined proposals is to protect the lake basin's rare and disappearing biodiversity while "seek[ing] to achieve a sustainable balance between preservation of landscapes and biodiversity, regeneration of natural resources and their rational use."³³⁸

³²⁹ *Id.* at 29-30.

³³⁰ *Id.*

³³¹ *See id.* at xi-xii, 42; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 9.

³³² LSAP, *supra* note 2, at xi-xii.

³³³ *Id.* at xii, 33-34.

³³⁴ *Id.* at 33.

³³⁵ *Id.*

³³⁶ *Id.*

³³⁷ *Id.* at 33.

³³⁸ *Id.* at 34.

Phase III activities are primarily intended to improve Lake Sevan's water quantity and quality, strengthen Lake Sevan National Park, and promote cooperation in biodiversity management throughout the Caucasus.³³⁹ Recommendations addressing the lake's water quantity are significant because they lie at the roots of Sevan's current problems—the lowering of its water level begun over seventy years ago.

Activities targeted in Phase III are intended to increase Lake Sevan's water level by implementing a variety of policy and regulatory measures. These measures include restricting and carefully monitoring water releases, setting pricing policies for releases, promoting and adopting technical measures to increase efficient use and reduce water losses in industrial, agricultural, and domestic uses, and taking appropriate management and technical actions to make hydropower generation more efficient and less water intensive.³⁴⁰ The Action Program also requires the implementation of technical measures to increase inflow to the lake.³⁴¹

The LSAP further suggests studying in greater detail and possibly implementing two technical measures which have been contemplated since the Soviet-1980s to raise Sevan's water level. One of these involves completion of the Vorotan tunnel, a project akin to the Arpa-Sevan tunnel which would provide an additional 165 million cubic meters of water per year to Lake Sevan.³⁴² The other calls for construction of the Yeghvard Reservoir, a measure that would greatly reduce the need for agricultural water releases from Lake Sevan.³⁴³

Phase IV of LSAP continues to focus on increasing Lake Sevan's water quantity, including continued emphasis on the Vorotan tunnel and Yeghvard reservoir projects.³⁴⁴ This final phase also emphasizes water quality improvement, specifically the building of wastewater treatment plants and rehabilitation of sewage pipelines.³⁴⁵ The Action Program also proposes taking measures to restore the former Gilly Lake, a smaller sister lake to Sevan that was completely desiccated during the Soviet era.³⁴⁶ Along with water quality improvement, Phase IV recommends concurrent efforts to stimulate fisheries in Lake Sevan, particularly, rehabilitating the lake's trout hatcheries and developing a commercial crayfish fishery.³⁴⁷

³³⁹ *Id.* at xii, 30-34, 43; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 10.

³⁴⁰ LSAP, *supra* note 2, at 30.

³⁴¹ *Id.* at 30.

³⁴² *Id.* at 15, 30-31.

³⁴³ *Id.*

³⁴⁴ *Id.* at xii, 43; LSAP, EXECUTIVE SUMMARY, *supra* note 13, at 11.

³⁴⁵ LSAP, *supra* note 2, at 31-32.

³⁴⁶ *Id.* at 34-35.

³⁴⁷ *Id.* at 35.

3. USAID

The United States Agency for International Development (USAID) has established a multi-faceted program in Armenia.³⁴⁸ The program commits USAID to work in partnership with Armenians for the country's economic and social development, and toward its transition to democracy, a capitalist economy, and government by rule of law.³⁴⁹ One component of the USAID Armenia Program focuses on energy and water resource management.³⁵⁰ The agency notes that the current state of Armenia's water sector is troubling:

Armenia's water sector is characterized by the deteriorated condition of its drinking water and wastewater infrastructure, over-exploitation of Lake Sevan, degraded irrigation systems, pollution of potable water sources, lack of rational allocation of water resources, and inadequate management of transboundary waters.³⁵¹

Given this situation, the "over-arching goal" of USAID's water management program is "to develop Armenian capacity to promote sustainable management of water resources to support enhanced environmental quality and economic growth."³⁵²

In furtherance of this stated goal and in response to some of the severe water resource problems plaguing Armenia, USAID has embarked on a number of initiatives. It provided advice and assistance to the Armenian government for the creation of a new Water Code of the Republic of Armenia, enacted in 2002.³⁵³ It also worked to initiate a South Caucasus regional water management program, bringing together water management institutions from the three South Caucasus countries: Armenia, Azerbaijan, and Georgia.³⁵⁴ These developments brought more effective information sharing and communication on crucial issues of regional water management.³⁵⁵

³⁴⁸ See USAID/ARMENIA STRATEGIC PLAN, *supra* note 11; SCIENCE AND TECHNOLOGY IN ARMENIA, *supra* note 10, at 59-61.

³⁴⁹ See USAID/ARMENIA STRATEGIC PLAN, *supra* note 11, at 17-45; USAID, *Mission to Armenia: Water Management Program* 1-3, available at <http://www.usaid.gov/am/program.html>; SCIENCE AND TECHNOLOGY IN ARMENIA, *supra* note 10, at 59-61.

³⁵⁰ See USAID/ARMENIA STRATEGIC PLAN, *supra* note 11, at 21-27.

³⁵¹ USAID, *Mission to Armenia: Water Management Program*, *supra* note 350, at 1.

³⁵² See USAID, *Mission to Armenia: National Water Management Program* 1, available at <http://www.usaid.gov/am/activitypages/ardwater.html>.

³⁵³ See text accompanying notes 448-79, *infra*.

³⁵⁴ USAID, *Mission to Armenia: Program Overview* 3, available at <http://www.usaid.gov/am/program.html>; USAID, *Mission to Armenia: National Water Management Program*, *supra* note 353, at 2.

³⁵⁵ USAID, *Program Overview*, *supra* note 337, at 3; USAID, *Water Management Program*, *supra* note 355, at 2.

USAID has undertaken initiatives in Armenia that are directed specifically toward restoration and management of Lake Sevan.³⁵⁶ The agency has sought to increase public awareness of the lake's ecological situation and to encourage public participation in lake clean-up efforts.³⁵⁷ It also developed a "Sevan-Hrazdan Basin Water Resources Monitoring Strategy," designed to enhance water quality and quantity assessment in the greater Sevan-Hrazdan catchment basin.³⁵⁸ The strategy calls for monitoring twenty-nine water quality parameters at each of sixty-five sites in the basin.³⁵⁹ It also includes monitoring two flow and depth parameters at seven hydroposts located across the full range of the greater basin area, from the Arpa-Sevan tunnel to the confluence of the Hrazdan and Araks Rivers.³⁶⁰ Moreover, USAID is assisting the Armenian Hydrometeorological Service (Armhydromet) to develop its capabilities to support integrated water management in the Sevan-Hrazdan basin.³⁶¹

D. Armenian Laws Specific to Lake Sevan

Four Armenian laws or regulations directly and exclusively address Lake Sevan. These include: (1) the Charter of Sevan National Park, which was originally adopted by the USSR in 1978 but carried over without change when Armenia became an independent republic; (2) Regulations on Commercial Fishing in Lake Sevan; (3) Law of the Republic of Armenia on Lake Sevan; and (4) Law on Approval of Overall and Annual Plans of Restoration, Preservation, Reproduction and Usage of Ecosystems of Lake Sevan. This section summarizes each of these enactments. The section also discusses a fifth law, the Water Code of the Republic of Armenia, a law of general application enacted in 2002, which, as to its impact on Lake Sevan, is best understood against the backdrop of the four laws or regulations specific to the lake.

1. Charter of Sevan National Park

While the Charter for Sevan National Park was adopted in 1978 during the Soviet era, the Park today comes under the jurisdiction of the Ministry of Nature Protection of the Republic of Armenia.³⁶² As noted above, the Charter makes the Park the only permanent user of the 150,100 hectares of territory falling within its boundaries.³⁶³ All other users can engage in activities within the park

³⁵⁶ USAID, *National Water Management Program*, *supra* note 353, at 2-3.

³⁵⁷ *Id.* at 3.

³⁵⁸ *Id.* at 2.

³⁵⁹ *Id.*

³⁶⁰ *Id.* at 2-3.

³⁶¹ USAID, *Water Management Program*, *supra* note 350, at 1.

³⁶² *See Sevan National Park*, *supra* note 220.

³⁶³ *See* CHARTER OF SEVAN NATIONAL PARK art. 1 (1978).

boundaries only by contractual permission obtained from the park administration.³⁶⁴

Pursuant to its Charter, the territory of Sevan National Park is divided into three zones: (1) a core protected reserve zone, (2) a recreational zone, and (3) an economic use zone.³⁶⁵ The Charter lists the activities that are allowed or forbidden within each zone.³⁶⁶ The most significant and stringent stipulations for the restoration of Lake Sevan are the Charter's provisions regarding the core protected reserve zone.

In general, the Sevan National Park Charter prohibits activities that have the potential to destroy any of the natural ecosystems or natural objects found in the protected core zone, or that threaten the protection of objects of scientific or cultural value. Prohibited activities include exploitative use of land, natural resources, or water resources; any activity that disturbs Lake Sevan's water regime; construction and economic activity not needed for the functioning of the protected zone itself, including construction of roads, pipelines, and electricity lines; hunting, fishing, and any disturbance of animal habitat; all efforts to enhance particular species of plants or animals, including introduction of new species; all use of chemicals, pesticides, or fertilizers; tree harvesting, plant collection, cattle grazing, grass mowing, or other disturbance of plant cover; and all use of motor vehicles except on permitted roads.³⁶⁷ Activities allowed in the protected core zone include measures to prevent human-caused natural ecosystem disturbance; work aimed at eliminating diseases dangerous to humans, animals, or plants; ecological tourism; and efforts to restore historical cultural objects as provided under other laws of the Republic.³⁶⁸

In addition to stipulating prohibited and permitted uses in the protected core zone of the park, the Charter of Sevan National Park also lists permitted and prohibited uses in the park's other two zones.³⁶⁹ The list of allowed activities becomes increasingly permissive moving from the core to the recreational zone to the outer zone of economic use. Research activities allowed or encouraged in Sevan National Park are aimed at monitoring ecological processes in the park's ecosystems and promoting the rational use of natural resources.³⁷⁰ Work plans for research projects must be approved by the Ministry of Nature Protection.³⁷¹

2. Regulations on Commercial Fishing in Lake Sevan

The first legal enactment issued by the independent Republic of Armenia to address Lake Sevan explicitly came in a set of Regulations on Commercial

³⁶⁴ *Id.* art. 2; *Sevan National Park*, *supra* note 220.

³⁶⁵ CHARTER OF SEVAN NATIONAL PARK, *supra* note 364, at Ch. III.

³⁶⁶ *Id.* Ch. IV.

³⁶⁷ *Id.* art. 6.

³⁶⁸ *Id.* art. 7.

³⁶⁹ *Id.* art. 8-9.

³⁷⁰ *Id.* art. 20.

³⁷¹ *Id.*

Fishing in Lake Sevan adopted in 1996. The regulations authorize commercial fishing in the lake on licensed and contractual bases by enterprises and private businesses.³⁷² Licenses are issued by the Ministry of Nature Protection³⁷³ according to the resolutions of a Permits Committee which consists of government and public representatives.³⁷⁴ Licenses are good for up to five years and entitle their holders to apply for fishing contracts on a year-to-year basis.³⁷⁵ Central to the issuance of annual fishing contracts are the yearly determinations of the Department of Specially Protected Areas, a branch of the Ministry of Nature Protection. Each year, the Department sets the dates for the fishing season, the areas open to commercial fishing, the types and number of boats permitted, and the types of fishing equipment allowed.³⁷⁶ It also sets maximum quotas for the number of each fish species that can be taken during a fishing season.³⁷⁷

The administrative body responsible for final consideration of commercial fishing contracts is the Sevan National Park.³⁷⁸ The contract becomes the primary regulatory document between the government and the licensed commercial fisher.³⁷⁹ It stipulates the rights and obligations of all parties, designates the assigned fishing areas and fish species available for catch, identifies boat types and equipment permitted, and sets forth all other contractual conditions, including specified fishing conditions and dates.³⁸⁰ A commercial fishing “passport” is then attached to the contract.³⁸¹ The passport contains information on the contracted fishing area and pertinent fishing rules, and is updated periodically to reflect the number of fish a commercial fisher has already taken and may still catch.³⁸²

Monitoring of commercial fishing in Lake Sevan is the responsibility of the Sevan National Park’s Conservation Service.³⁸³ The Conservation Service registers the boats permitted for commercial fishing on the lake and is charged with regulating the daily fishing activities.³⁸⁴ Commercial fishing boats are allowed on the lake only during daylight hours and may launch only at specially identified inspection sites.³⁸⁵ Violations of any environmental laws, fishing

³⁷² REGULATION ON COMMERCIAL FISHING IN LAKE SEVAN, Ch. I, § 3 (1996).

³⁷³ *Id.* Ch. II, § 4.

³⁷⁴ *Id.*

³⁷⁵ *Id.* Ch. II, § 6.

³⁷⁶ *Id.* Ch. III, § 8.

³⁷⁷ *Id.* Ch. III, § 7.

³⁷⁸ *Id.* Ch. III, §§ 10-13.

³⁷⁹ *Id.* Ch. III, § 13.

³⁸⁰ *Id.*

³⁸¹ *Id.*

³⁸² *Id.*

³⁸³ *Id.* Ch. IV, § 18.

³⁸⁴ *Id.* Ch. IV, § 19.

³⁸⁵ *Id.* Ch. IV, § 20.

rules, or license or contract conditions are reported by the Conservation Service to the Park's administration for possible prosecution.³⁸⁶

3. Law of the Republic of Armenia on Lake Sevan

The most significant single law in Armenia concerning Lake Sevan is the aptly titled Law of the Republic of Armenia on Lake Sevan, enacted in 2001. The law is the product of several years' deliberation. Talk of creating a special law for Lake Sevan started in 1994, when the possibility of World Bank grant funding for the Lake Sevan Action Program (LSAP) was first raised.³⁸⁷ As noted above,³⁸⁸ upon LSAP's publication in 1998 it became, in a sense, a constitution-like document for subsequent legislation and regulations addressing the ecological situation in Lake Sevan and its catchment basin.³⁸⁹ LSAP proposed the enactment of a single law in Armenia "consolidat[ing]" in one place a full regulatory framework for the lake's restoration and protection.³⁹⁰ The Law of the Republic of Armenia on Lake Sevan marks the fulfillment of that proposal.

The Lake Sevan Law establishes a legal and programmatic framework for the "restoration, reproduction, protection and use of natural resources of Lake Sevan."³⁹¹ It recognizes that the lake holds "strategic significance" for the people of Armenia as an ecosystem with "economic, social, scientific, historical-cultural, esthetical, recreational and spiritual value for the Republic of Armenia."³⁹²

Declaring Lake Sevan and its "ecotone area"³⁹³ to be inalienable state property of the Republic of Armenia,³⁹⁴ the law establishes a structure of ecological zoning for the "restoration, protection, regeneration and use of the Lake Sevan ecosystem."³⁹⁵ Three ecological zones are specified, which encompass the lake, "its catchment basin and areas beyond [the] Lake Sevan catchment basin within [thirty kilometers] distance from the water divide inside the borders of the Republic of Armenia."³⁹⁶ Within the central, direct impact,

³⁸⁶ *Id.* Ch. IV, § 22, Ch. VI, § 26.

³⁸⁷ Anne Shrinian-Orlando, *An Examination of Laws Affecting Lake Sevan*, ARMENIAN NEWS NETWORK / GROONG, January 7, 2003, at <http://groong.usc.edu/ro/ro-20030107.html> at 4.

³⁸⁸ See *supra* text accompanying notes 304-48.

³⁸⁹ See *id.*

³⁹⁰ LSAP, *supra* note 2, at 26.

³⁹¹ Law on Lake Sevan, Preamble (2001) (Arm.).

³⁹² *Id.*

³⁹³ *Id.* The Law defines "Ecotone" as a "transitional zone of interconnected water and land ecosystems, which includes water and land areas around the shoreline. Depending on the landscape of the water catchment basin, the width of the ecotone can vary between 5-150 meters." *Id.* Ch. 1, art. 3.

³⁹⁴ *Id.* Ch. 1, art. 4.

³⁹⁵ *Id.* Ch. 2, art. 5.

³⁹⁶ *Id.* Ch. 1, art. 1.

and indirect impact zones³⁹⁷ “economic and other activities” affecting the lake and its watershed basin, including the use of natural resources therein, are regulated according to sliding degrees of restriction.³⁹⁸

The central zone includes the territory of Sevan National Park.³⁹⁹ This area receives “special regulation” with only limited economic or urban development activities allowed.⁴⁰⁰ The guiding regulatory principle for the central zone is “to protect and restore the natural state of the Lake Sevan ecosystem—water quality, natural landscape and biodiversity of the lake and the land areas near the shore.”⁴⁰¹

The direct impact zone encompasses the Sevan catchment basin from the borders of the central zone to the water divide.⁴⁰² Urban development activities are subject to special regulation in the direct impact zone, especially “any activit[ies that] directly or indirectly affect[] hydro-physical, hydro-chemical, hydro-biological, sanitary-toxicological [or] other quality and quantity parameters of Lake Sevan and rivers running into it.”⁴⁰³ The indirect impact zone provides a buffer extending thirty kilometers beyond the Sevan catchment basin.⁴⁰⁴ The purpose of the indirect impact designation is “to prevent the possible impact conveyed through air flows over Lake Sevan and other routes.”⁴⁰⁵

The controlling standard in all three of the Sevan ecological zones is one of ‘dangerous impact.’ All types of activities undertaken in the central, direct impact, and indirect impact zones that pose a ‘dangerous impact’ on the Lake Sevan ecosystem are prohibited.⁴⁰⁶ In addition, certain activities are expressly prohibited within the central and direct impact zones, such as mineral processing, any activities related to hazardous, toxic, or radioactive wastes, and thermal energy production over a certain capacity.⁴⁰⁷ Economic activities are permitted in the two interior zones only in accordance with regulations.⁴⁰⁸ Furthermore, the law calls for the development of rules and policies for planning, programming, and financing activities related to tourism, urban and infrastructure development, and construction within the direct impact zone, all directed toward the “protection and restoration of landscapes.”⁴⁰⁹

³⁹⁷ *Id.* Ch. 2, arts. 6-9.

³⁹⁸ *Id.*

³⁹⁹ *Id.* Ch. 2, art. 7.

⁴⁰⁰ *Id.*

⁴⁰¹ *Id.*

⁴⁰² *Id.* Ch. 2, art. 8.

⁴⁰³ *Id.*

⁴⁰⁴ *Id.* Ch. 2, art. 9.

⁴⁰⁵ *Id.*

⁴⁰⁶ *Id.* Ch. 2, art. 10.

⁴⁰⁷ *Id.*

⁴⁰⁸ *Id.*

⁴⁰⁹ *Id.* Ch. 7, art. 29.

The Lake Sevan Law goes on to create a program framework for a national policy of restoring and protecting the lake's ecosystem.⁴¹⁰ The framework involves the creation of two programs, a Comprehensive Program and an Annual Program.⁴¹¹ The stated goal of the Comprehensive Program is "to ensure restoration, protection, reproduction and use of the Lake Sevan ecosystem."⁴¹² The Annual Program sets forth the activities planned by the government each year to implement the Comprehensive Program.⁴¹³ The Law on Lake Sevan ensures compliance with these mandates by requiring that the National Assembly pass into law both the Comprehensive Program and the Annual Program.⁴¹⁴ Moreover, it stipulates that the programs be developed

⁴¹⁰ *Id.* Ch. 3.

⁴¹¹ *Id.* Ch. 3, art. 11.

⁴¹² *Id.* Ch. 3, art. 11, § 2.

⁴¹³ *Id.* Ch. 3, art. 11, § 4. The contents of the Comprehensive and Annual Programs, as stipulated by the Law, are as follows:

Article 12. Contents of Comprehensive and Annual Programs and Principles of Their Elaboration

1. Comprehensive and Annual Programs contain:

- (a) main problems;
- (b) information about water resources, fauna and flora, and ecological subsystems of Lake Sevan and its catchment basin;
- (c) planned volume of work and timetable for its completion;
- (d) financial proportions of the planned work;
- (e) principles for execution of programs and priorities for implementation of the planned activities;
- (f) principles, methods and types of implementation of activities in Lake Sevan and its ecotone area based on regulations established by the Government of the Republic of Armenia;
- (g) other conditions, that are necessary for a complete presentation of programs.

2. [T]he Comprehensive Program also includes:

- (a) planned work by the authorized bodies;
- (b) order of supervision of planned activities and their funding process.

3. The Annual Program includes also:

- (a) analysis of current and anticipated instruction of intended activities;
- (b) plans and current schedules for water release and unrecoverable water intake that do not disturb Lake Sevan ecological sustainability and ensure positive water balance of the lake;
- (c) annual maximal quantity of water releases and intake from Lake Sevan, provided on a monthly basis;
- (d) annual maximal quantity of extraction and commercial hunting of biological resources (including fish and shellfish) and their industrial quality characteristics, provided on a monthly basis.

Id.

⁴¹⁴ See *id.* Ch. 3, art. 11, § 3 ("Comprehensive Program is passed by the National Assembly through adoption of a pertinent law."); *id.* Ch. 3, art. 13, § 1 ("The Annual Program is passed by the National Assembly through adoption of a law prior to approval of the state budget of the respected year.").

under four operative principles: program conformity, balance of program activities and funding, program consistency, and accountability.⁴¹⁵ Management of the Lake Sevan ecosystem under the law is divided among a number of entities ranging from the local to the national government level.⁴¹⁶ Most significantly, the law creates an administrative body, the Experts Commission on Conservation of Lake Sevan.⁴¹⁷ The commission is responsible for assessing the Comprehensive and Annual Programs,⁴¹⁸ and for providing conclusions as to the “validity of the Program objectives and activities,”⁴¹⁹ the feasibility of the programs,⁴²⁰ the reasonableness of financial resource estimates,⁴²¹ and the “conformity of the Programs... to the requirements of [the] Law.”⁴²²

Further, the Law on Lake Sevan creates a specific Conservation System for the lake ecosystem.⁴²³ The major components of the Conservation System are urban and landscape planning requirements⁴²⁴ and completion of environmental impact assessments as required by law for any anticipated ecological, natural resource, or environmental impacts.⁴²⁵ The EIA requirement is quite straightforward, referencing other legislation of the Republic of Armenia, presumably the EIE.⁴²⁶ The EIA procedural requirements established by the Law on Lake Sevan are stated succinctly:

Prior to commencing activities or technological changes, commercial entities are obliged to submit an appropriate statement to the Authorized Body. Within one month upon receiving the statement, the Authorized Body has to make a decision on permitting or prohibiting the given activity based on ecological, natural resource use, environmental as well as other impact assessment established by law.⁴²⁷

The urban and landscape planning requirements of the Lake Sevan Conservation System are somewhat less routine. The Law stipulates that any “allotment, use [or] alienation of water, land [or] other natural resources” within the central or direct impact zones of the lake’s ecosystem must proceed in

⁴¹⁵ *Id.* Ch. 3, art. 12, § 5.

⁴¹⁶ *Id.* Ch. 4.

⁴¹⁷ *Id.* Ch. 5.

⁴¹⁸ *Id.* Ch. 5, art. 19, § 1; art. 20.

⁴¹⁹ *Id.* Ch. 5, art. 21, § 3(a).

⁴²⁰ *Id.* Ch. 5, art. 21, § 3(f).

⁴²¹ *Id.* Ch. 5, art. 21, § 3(b).

⁴²² *Id.* Ch. 5, art. 21, § 3(d).

⁴²³ *Id.* Ch. 6.

⁴²⁴ *Id.* Ch. 6, arts. 22, 23.

⁴²⁵ *Id.* Ch. 6, arts. 22, 24-25.

⁴²⁶ *See id.* Ch. 6, art. 24 (“Ecological impact assessment is fulfilled according to rules established by the legislation of the Republic of Armenia.”).

⁴²⁷ *Id.* Ch. 6, art. 25.

accordance with approved development plans.⁴²⁸ The plans must be approved by the “relevant authorized bodies,” and must conform to “rules established by the Government of Armenia” for “ecological, environmental, [and] natural resource... impact assessment.”⁴²⁹ Again, the reference here is presumably to the EIE.

Finally, the Law on Lake Sevan lists certain prohibited activities. The prohibited activities include, foremost, any introduction into the lake ecosystem of toxic or non-toxic materials, including biogenic elements that do not readily dissolve in water, can be conveyed through the food chain, or are otherwise dangerous for the lake ecosystem.⁴³⁰ The law also prohibits, except as otherwise provided by law, the introduction of non-native plants and animals into any of the Lake Sevan ecosystem’s three ecological zones.⁴³¹ In the event of accidental commercial discharges of dangerous substances or biological pollutants into the lake ecosystem, the commercial entity involved must take immediate remedial action.⁴³² Those responsible for prohibited discharges resulting in “consequences of negative occurrences,” accidental or not, bear liability for the response costs.⁴³³ Willful violation of the law gives rise to liability according to the laws of the Republic.⁴³⁴

4. Law on Approval of Overall and Annual Plans of Restoration, Preservation, Reproduction and Usage of Ecosystems of Lake Sevan

As noted above,⁴³⁵ the Law on Lake Sevan created an Experts Commission on Conservation of Lake Sevan.⁴³⁶ Most significantly, the law charged the Commission with overseeing the development of the Comprehensive and Annual Programs for Lake Sevan and its basin.⁴³⁷ The Commission quickly discharged that responsibility, submitting the first Comprehensive and Annual Plans to the Armenian National Assembly in late 2001.⁴³⁸ The National Assembly then approved the plans and enacted them as the Law on Approval of Overall and Annual Plans of Restoration, Preservation, Reproduction and Usage of Ecosystems of Lake Sevan.⁴³⁹

⁴²⁸ *Id.* Ch. 6, art. 23.

⁴²⁹ *Id.*

⁴³⁰ *Id.* Ch. 7, art. 26, § 1.

⁴³¹ *Id.* Ch. 7, art. 27.

⁴³² *Id.* Ch. 7, art. 28.

⁴³³ *Id.*

⁴³⁴ *Id.* Ch. 7, art. 31.

⁴³⁵ *See supra* text accompanying notes 417-23.

⁴³⁶ *See id.* Ch. 5.

⁴³⁷ *Id.* Ch. 5, art. 19, § 1; art. 20.

⁴³⁸ Anne Shrinian-Orlando, *supra* note 388.

⁴³⁹ Law on Approval of Overall and Annual Plans of Restoration, Preservation, Reproduction and Usage of Ecosystems of Lake Sevan (2001) (Arm.).

As required under the Lake Sevan Law, the Law on Approval of Overall and Annual Plans is the product of initial research, environmental assessments, and data gathering. Given the extremely short time between enactment of the two laws, however, the Overall and Annual Plans Law adds very little substance to the overall restoration program. The principal contribution of the law comes in its clarification of the purposes and objectives behind completion of the comprehensive and annual plans.⁴⁴⁰ A primary purpose of the plans is to protect and enable the restoration of Lake Sevan as an ecologically balanced freshwater lake.⁴⁴¹ The plans seek to ensure natural, harmonized development and sustainable use of the lake and its watershed ecosystem.⁴⁴²

The Law on Approval of Overall and Annual Plans further specifies certain program objectives, including preventing any decrease in Lake Sevan's water level while striving to accomplish a six meter increase.⁴⁴³ The law declares that attaining such an increase is a necessary prerequisite to restoration of the lake's former quantitative and qualitative water parameters and to prevent any further eutrophication.⁴⁴⁴ The law also identifies the program objective of decreasing negative anthropogenic influences, including pollution, into the Lake Sevan ecosystem by establishing regulations and norms for the use of natural resources in the lake or its basin.⁴⁴⁵ Finally, the law sets forth a number of more specific objectives: to ensure protection of the lake water as a drinking water source, to encourage the rehabilitation of fish resources, to spur development of recreation and tourism, to protect biodiversity, to improve the management system of the lake, and to create an effective system of water use.⁴⁴⁶

5. Water Code of the Republic of Armenia

While not a law enacted specifically for Lake Sevan, the Water Code of the Republic of Armenia holds special significance in the management and regulatory framework concerning the lake. Enacted in 2002, the Water Code aims to provide a comprehensive legal framework for managing, conserving, and protecting the Republic's water resources. It aims to accomplish this in part by establishing a National Water Policy⁴⁴⁷ and a National Water Program.⁴⁴⁸ The Water Code further sets forth procedures for developing water quality standards⁴⁴⁹ and Water Basin Management Plans.⁴⁵⁰ It also provides for the

⁴⁴⁰ See *id.* at art. 2.

⁴⁴¹ *Id.*

⁴⁴² *Id.*

⁴⁴³ *Id.*

⁴⁴⁴ *Id.*

⁴⁴⁵ *Id.*

⁴⁴⁶ *Id.*

⁴⁴⁷ WATER CODE OF THE REPUBLIC OF ARMENIA, Ch. 3, arts. 15, 16.

⁴⁴⁸ *Id.* Ch. 3, art. 16.

⁴⁴⁹ *Id.* Ch. 8.

⁴⁵⁰ *Id.* Ch. 3, art. 17.

issuance of water use permits,⁴⁵¹ the creation of administrative bodies for water resources management, and a procedure for adopting and implementing the various standards, plans, and permitting programs.⁴⁵² All aspects of the Water Code are to be carried out to fulfill a four-part statement of purpose:

The main purpose of this Code is the conservation of the national water reserve, the satisfaction of water needs of citizens and economy through effective management of useable water resources, securing ecological sustainability of the environment, as well as the provision of a legal basis to achieve the objectives of this Code.⁴⁵³

Several provisions of the Water Code appear to bear upon management and protection of Lake Sevan. As a “water resource” under the code,⁴⁵⁴ Sevan seems to fall under the full scope of its regulatory provisions. Yet a highly ambiguous reference to the lake leaves the code’s application to Sevan unclear. Article 2 reads in part: “The issues of management and protection of Lake Sevan are regulated by the law.”⁴⁵⁵ The ambiguity arises from the term, “the law.” That term could mean (1) all laws of the Republic of Armenia inclusive of the Water Code; (2) all laws of the Republic exclusive of the code; (3) the code only; or (4) the Law on Lake Sevan only, as the sole law regulating the lake.

The most reasonable reading of Article 2 would be the first. Were the article meant to restrict management and regulation of Lake Sevan to only one law—either the Water Code or the Law on Lake Sevan—an express reference to either law would have been stated expressly. Moreover, it makes no sense to limit regulation to the Water Code, given the passage of the Law on Lake Sevan just one year prior.

Reading Article 2 as placing all management, regulation, and protection of Lake Sevan under the Law on Lake Sevan only, thereby excluding the lake from regulation under the Water Code, does have a textual basis. Support for this reading comes from the paragraph immediately preceding Article 2, which states: “Water relations in the Republic of Armenia are regulated by this Code, laws of the Republic of Armenia and other legal acts.”⁴⁵⁶ The reference in the paragraph to the Water Code separate from “laws of the Republic of Armenia” suggests that the reference to “the law” in “[t]he issues of management and protection of Lake Sevan are regulated by the law” may indeed exclude the Water Code. However, this argument for exclusion is very thin and rests on an exercise in interpretation not at all befitting the clarity to be expected in a civil code. Moreover, a provision in the Law on Lake Sevan itself belies this exclusionary reading. Far from proffering itself as the sole law regulating the

⁴⁵¹ *Id.* Ch. 4, 5.

⁴⁵² *Id.* Ch. 2.

⁴⁵³ *Id.* art. 6.

⁴⁵⁴ *Id.* Ch. 1, art. 1 (defining water resources as including all surface waters, including any lake).

⁴⁵⁵ *Id.* Ch. 1, art. 2.

⁴⁵⁶ *Id.*

Lake Sevan ecosystem, the Law on Lake Sevan states: "Relations in the field of restoration, protection, reproduction and use of the ecosystem of Lake Sevan are regulated by the Constitution, this Law, [and] *other laws and legal acts*."⁴⁵⁷ The most reasonable reading of Article 2 of the Water Code, therefore, is to treat the term "the law" as an inclusive reference to every law of the Republic of Armenia, bringing Lake Sevan fully within the Water Code's regulatory framework.

On the assumption, then, that the Water Code fully applies to Lake Sevan, the import of the code becomes critical. Central to the Water Code is its creation of a National Water Policy and a National Water Program for Armenia. The National Water Policy "[e]stablishes perspective [sic] objectives and problems for strategic development of water resources use and protection . . . [and] water use priority principles"⁴⁵⁸ The objectives, strategic development goals, and priority principles identified in the National Water Policy are to be implemented through the National Water Program.⁴⁵⁹ That program in turn describes the procedures to be used for setting reporting requirements, classification structures, and management and conservation strategies for each water basin management area in the country.⁴⁶⁰

The National Water Program is of particular significance. The Water Code stipulates that, based on the National Water Program, the government shall approve a Water Basin Management Plan for each water basin management area, including Lake Sevan.⁴⁶¹ The Water Basin Management Plans are designed to "balance the interconnected relationship of all water users, including communities, power generation, industry, agriculture and environment."⁴⁶² Specifically, the plans describe the following:

Article 16. National Water Program

The National Water Program shall describe for each water basin management area approved by the Government:

1. Boundaries, quantity, quality of water available, and classification of water resources;
2. Classification of water systems;
3. Volumes of the National Water Reserve and measures to enhance its preservation;
4. Current water use by various sectors and associated complex impacts to water resources allocation;
5. Water demand based on priorities;

⁴⁵⁷ LAW ON LAKE SEVAN, *supra* note 392, at Ch. 1, art. 2 (emphasis added).

⁴⁵⁸ WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 3, art. 15.

⁴⁵⁹ *See id.* Ch. 1, art. 1, Ch. 3, art. 16.

⁴⁶⁰ *Id.* Ch. 3, art 16.

⁴⁶¹ *Id.* Ch. 3, art. 17.

⁴⁶² *Id.*

6. Criteria for effectiveness of current water conservation and management activities, volumes of defined environmental flows and maximum allowable volumes of irreversible water withdrawal to ensure maintaining of safe environmental state of water resources and ability for self-restorability;
7. Strategy for storage, allocation and use of water resources;
8. Measures to improve water resources monitoring and pollution prevention, including the application of modern technologies;
9. Water standards;
10. Description of actions to be taken by various State government bodies for implementation of the program and their coordination;
11. Expenditures and income related to the implementation of the program;
12. Mechanisms to ensure public awareness;
13. List of specially protected basin areas or parts thereof,... for fauna and/or flora directly depending on them where application of a special protection system is needed;
14. Emergency and ecological disaster zones in water resources;
15. Description of the threats to the health of critical watersheds and wetlands and counter measures to prevent any negative impacts to water ecosystems.⁴⁶³

Several further provisions of the Water Code are also pertinent to the management and conservation of Lake Sevan. These include chapters establishing criteria for issuing water use permits,⁴⁶⁴ regulations for the use and management of state-owned water systems,⁴⁶⁵ criteria for the creation of water quality standards,⁴⁶⁶ and requirements for the protection of water resources.⁴⁶⁷ Chapter 15, entitled "Protection and State Supervision of Water Resources," is particularly significant. As previously noted, Lake Sevan constitutes a "water resource" as defined in the Water Code.⁴⁶⁸ It also holds the status of a "national monument"⁴⁶⁹ and a "specially protected water resource."⁴⁷⁰ Both designations and the specific requirements for the use and protection of water resources are established by the government.⁴⁷¹ The significance of "national monument"

⁴⁶³ *Id.* Ch. 3, art. 16.

⁴⁶⁴ *Id.* Ch. 4.

⁴⁶⁵ *Id.* Ch. 6.

⁴⁶⁶ *Id.* Ch. 8.

⁴⁶⁷ *Id.* Ch. 15.

⁴⁶⁸ *See id.* Ch. 1, art. 1 ('Water Resources' includes all surface waters, including any lake).

⁴⁶⁹ *See id.* Ch. 15, art. 105. Lake Sevan's status as a chartered National Park would seem to establish the 'national monument' designation.

⁴⁷⁰ *See id.* Ch. 15, art. 102. The regulation of commercial fishing in Sevan by the Ministry of Nature Protection's Department of Specially Protected Areas would appear to be an acknowledgment that the lake is a 'specially protected water resource'. *See* REGULATION ON COMMERCIAL FISHING IN LAKE SEVAN, *supra* note 373, at Ch. III.

⁴⁷¹ WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 15, art. 102, 105.

status is that it provides the basis for defining a water resource as a “natural preserve,” thus providing it with special protection.⁴⁷² “Specially protected water resource” status is important in that it brings with it an absolute prohibition on untreated discharges of wastewater and drainage water. Chapter 15 provides in pertinent part:

Article 104. Use of Water Resources for the Receiving of Wastewaters and Drainage Waters.

A water resource or its portions cannot be used for the discharge of wastewater and drainage water if . . .

2. The water resource is a part of a specially protected watershed;
3. The water resource is located in the neighborhood of resorts and areas used for... recreation purposes;
4. The water resource is a spawning and hibernation area for valuable species of fish;
5. The water resource is a habitat for valuable species of fauna and flora.⁴⁷³

While Lake Sevan arguably falls under the ambit of sections 2, 3, 4, and 5, section 2 provides the most general protection, as it is the only basin-wide prohibitory classification. Section 2 forbids such discharges in any “specially protected watershed,” defined under the Code as “watersheds and wetlands, or parts thereof, which have international significance from a water standards protection standpoint.”⁴⁷⁴ Given the “international significance” of Lake Sevan, a significance “ratified by international agreements of the Republic of Armenia,”⁴⁷⁵ the lake’s status as a “specially protected water resource” seems foregone.

Apart from Lake Sevan’s status as a “specially protected water resource” or a “national monument,” Chapter 15 identifies several primary foci regarding the protection of water resources that are pertinent to Lake Sevan. The Chapter reads in part:

Article 99. Primary Requirements Towards the Protection of Water Resources. The water resources in the Republic of Armenia shall be protected. The primary requirements towards the protection of water resources are as follows:

⁴⁷² See *id.* Ch. 15, art. 105.

⁴⁷³ *Id.* Ch. 15, art. 104.

⁴⁷⁴ *Id.* Ch. 1, art. 1.

⁴⁷⁵ *Id.* Ch. 15, art. 102 (“The status and protection regime for the specially protected water resources of international significance are ratified by international agreements of the Republic of Armenia.”).

1. The use of water resources is permitted only in conditions of their protection and restoration;
2. The water resources are a constituent part of the ecosystem and the natural landscape, and their protection shall be stipulated by the maintenance of balance within the given ecosystem;
3. The water resources shall be subject to protection when used . . .
5. If used, the protection of water resources must maintain the balance in the given ecosystem;
6. Water resources shall be subject to protection from pollution . . . and depletion;
7. Wastewater discharge shall be permitted only in conformance with the requirements of this Code, if a corresponding water use permit for such discharge is available;
8. No disturbance to water protection zones shall be allowed, unless otherwise provided by this Code . . .
11. Emission, outflow or burial of radioactive and toxic waste in water resources is prohibited.⁴⁷⁶

The Water Code thus offers serious prospects for meaningful protection of Lake Sevan. Read together with the Law on Lake Sevan and the Overall and Annual Plans Law, the code creates a regulatory structure that, if enforced, would secure the Sevan ecosystem from all forms of negative influence, from the introduction of toxics and discharge of wastewaters to any actions or use that would deplete the resources of the lake or otherwise disturb the balance of its ecosystem. The extent to which these laws become meaningfully implemented and strictly enforced will thus determine the lake's future. We now offer an assessment of that future set atop this arguably ambitious legislative agenda and in the context of the broader social and economic situation in Armenia.

III. ASSESSMENT OF LAWS AND MANAGEMENT PLANS FOR LAKE SEVAN

As discussed above, significant attention from both within and outside Armenia has led to the emergence of a legislative and policy agenda to address the ongoing ecological problems at Lake Sevan that serve as an ever-present reminder of the Soviet desiccation plan. Armenian laws that directly address the lake's restoration are at the forefront of the agenda. These laws include the Law on Lake Sevan, the Overall and Annual Plans Law, and the Water Code.⁴⁷⁷ A number of Armenian environmental laws of general application and international action programs support these core laws.⁴⁷⁸ Together, the laws and

⁴⁷⁶ *Id.* Ch. 15, art. 99.

⁴⁷⁷ *See supra* text accompanying notes 392-479.

⁴⁷⁸ *See supra* text accompanying notes 230-391.

programs nestle the core laws in a comprehensive framework of valuable policy and priority recommendations.

Yet the Sevan agenda has only just been set. None of the Armenian laws or internationally sponsored program initiatives that specifically address the lake's restoration date earlier than 1999. A full-scale assessment of those laws and management plans is thus premature. In this final part, however, we will hazard a few remarks going to the overall prospects those laws and plans provide for meaningful restoration of Lake Sevan. The analysis is divided into six sections: statutory interpretation, water quantity, water quality, management issues, environmental impact assessment, and public participation and NGO involvement in environmental decision making.

A. *Statutory Interpretation*

The above discussion of the Water Code addressed the question whether the Law on Lake Sevan occupies the field of the lake's regulation, or if that law should be read together with other laws, including the Water Code, as forming a comprehensive regulatory program for the lake's management.⁴⁷⁹ That question was resolved in large part by reference to a provision in the Lake Sevan Law that places the lake's management under the collective regulation of "the Constitution, this Law, other laws and legal acts."⁴⁸⁰ That answer, however, raises a new interpretive question: how are the various laws that touch on management of Lake Sevan to be read in relation to one another?

The answer to this new question of statutory interpretation is that they should be read by reference and in harmony. It is a common rule of statutory construction that laws *in pari materia* must be interpreted by reference to each other.⁴⁸¹ As stated in 2003 by the United States Supreme Court:

The correct rule of interpretation is, that if divers statutes relate to the same thing, they ought all to be taken into consideration in construing any one of them.... If a thing contained in a subsequent statute, be within the reason of a former statute, it shall be taken to be within the meaning of that statute... ; and if it can be gathered from a subsequent statute *in pari materia*, what meaning the legislature attached to the words of a former statute, they will amount to a legislative declaration of its meaning, and will govern the construction of the first statute.⁴⁸²

Armenia is certainly not bound by the rules of statutory interpretation adopted by courts in the United States. Armenia is an independent republic and its law falls historically into the tradition of Roman civil law, not the Anglo-

⁴⁷⁹ See *supra* text accompanying notes 455-58.

⁴⁸⁰ L. ON LAKE SEVAN, *supra* note 392, at Ch. 1, art. 2.

⁴⁸¹ E.g., *Jackson v. Cockerham*, 847 So.2d 698, 702 (La.App. 2003). *Branch v. Smith*, 538 U.S. 254 (2003).

⁴⁸² *Branch*, 538 U.S. at 254.

American common law tradition. Yet the doctrine *in pari materia* is similarly celebrated in the Roman tradition.⁴⁸³ It is reasonable to expect, therefore, that the Armenian courts will adhere to it.

Reading the various Armenian laws that bear upon Lake Sevan in reference to each other under the doctrine *in pari materia* has interesting implications. The lake has enjoyed protected status since 1978 when the Soviets chartered Sevan National Park.⁴⁸⁴ The Charter for the park lists several forms of activity prohibited in its core, recreational, and economic zones.⁴⁸⁵ The prohibitions, however, especially for the “core” zone, are far too general and contain no standards or mechanisms for enforcement. Yet it would appear this is now subject to change. The administration of the park now must presumably take into account not only the charter itself, but the higher level of regulatory protection contemplated by the Lake Sevan Law, the Overall and Annual Plans Law, and the Water Code.

The Regulations on Commercial Fishing in Lake Sevan also become subject to stricter enforcement when read in conjunction with the other Sevan laws. The Commercial Fishing Regulations authorize the Department of Specially Protected Areas to stipulate maximum quotas for the number of each fish species that can be taken yearly.⁴⁸⁶ The Department also designates yearly fishing seasons, the number and types of boats allowed, and the areas of the lake open to commercial fishing.⁴⁸⁷ The Law on Lake Sevan complicates management of the lake’s yearly fish harvest by requiring that the Experts Commission on Conservation of Lake Sevan include “annual maximal quantity of extraction and commercial hunting of biological resources (including fish and shellfish)... “ in its Annual Programs.⁴⁸⁸ Given that the Law on Lake Sevan aspires “to protect and restore the natural state of the Lake Sevan ecosystem,”⁴⁸⁹ and imposes a “dangerous impact” standard on all activities occurring therein,⁴⁹⁰ increased restrictions on commercial fishing should be forthcoming. As discussed in Part I, *supra*, the Soviet desiccation of Sevan had profound and, in certain respects, devastating impacts on the lake’s natural biotic communities, including fish.⁴⁹¹ “[R]estor[ing] the natural state of the Lake Sevan ecosystem,” such as through reintroducing the winter bakhtak or bojak, and avoiding “dangerous impact[s],” such as extinction of the summer bakhtak, would require serious regulation of the commercial fishing industry. Such regulation can be

⁴⁸³ See, e.g., *Hall v. Brookshire Bros., Ltd.*, 848 S.W.2d 559, 575 (La. 2003); GENERAL PRINCIPLES OF SCOTS LAW 97 (Enid A. Marshall ed., 1999).

⁴⁸⁴ See *supra* text accompanying notes 220-23.

⁴⁸⁵ See *supra* text accompanying notes 363-72.

⁴⁸⁶ See REG. ON COMMERCIAL FISHING IN LAKE SEVAN, *supra* note 304, at Ch. III, § 7.

⁴⁸⁷ *Id.* Ch. III, § 8.

⁴⁸⁸ L. ON LAKE SEVAN, *supra* note 392, at Ch. 3, art. 12, § 3.

⁴⁸⁹ *Id.* Ch. 2, art. 7.

⁴⁹⁰ *Id.* Ch. 2, art. 10.

⁴⁹¹ See *supra* text accompanying notes 27-144.

expected from the Sevan Experts Commission, unless that body wholly foregoes its statutory charge.

While the Law on Lake Sevan strengthens the regulatory force of the Charter of Sevan National Park and the Regulations on Commercial Fishing, the Sevan Law itself is augmented by the Water Code. Of greatest significance are Articles 99 and 104 of the Water Code. These general directives from the Water Code strengthen the framework of protection and restoration of the lake and its watershed set forth in the Law on Lake Sevan. Article 99 identifies several "primary requirements" for the protection of water resources.⁴⁹² These include general limitations on use of water resources so as to ensure "their protection and restoration"⁴⁹³ and to "maintain the balance in the given ecosystem."⁴⁹⁴

Water resources are also "protect[ed] from pollution... and depletion" through Article 104.⁴⁹⁵ Specifically, Article 104 prohibits outright wastewater discharges in certain water resources.⁴⁹⁶ The classes of water resources designated for special protection include "specially protected watershed[s],"⁴⁹⁷ defined as "[w]atersheds and wetlands, or parts thereof, which have international significance from a water standards protection standpoint."⁴⁹⁸ Lake Sevan's inclusion on the Ramsar Convention List as a watershed of international importance⁴⁹⁹ requires its special protection under Article 104. Though the Law on Lake Sevan did not directly require halting all wastewater discharges into the lake, reading the law and the Water Code in reference to one another as laws *in pari materia* makes such discontinuance mandatory.

B. Water Quantity

In one way or another, all the current Armenian environmental laws discussed in Part II aim to improve the ecology of Lake Sevan and its watershed. Unlike the scientific studies and action plans completed in the 1990s, however, the Armenian laws put very little emphasis on counteracting the lowering of the lake's natural water level. These scientific and environmental studies identified the lake's desiccation as the principal reason for its deterioration during the twentieth century.⁵⁰⁰ Led by Dr. Hovhannisyan's influential 1994 study,⁵⁰¹ the "corner-stone" for Sevan's restoration according to scientists and environmentalists is the raising of its water level by at least six meters so as to

⁴⁹² See WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 15, art. 99.

⁴⁹³ *Id.* Ch. 15, art. 99, § 1.

⁴⁹⁴ *Id.* Ch. 15, art. 99, § 5.

⁴⁹⁵ *Id.* Ch. 15, art. 99, § 6.

⁴⁹⁶ See *id.* at Ch. 15, art. 104.

⁴⁹⁷ *Id.* Ch. 15, art. 104, § 2.

⁴⁹⁸ *Id.* Ch. 1, art. 1.

⁴⁹⁹ See *supra* text accompanying note 290.

⁵⁰⁰ See, e.g., LSAP, *supra* note 2.

⁵⁰¹ See HOVHANNISYAN, OZERO SEVAN VCHERA, SEGODNYA, *supra* note 21.

reverse the lake's unnatural eutrophication process.⁵⁰² Unfortunately, the current Armenian legislative agenda falls critically short of meaningfully confronting the lake's water quantity problems.

The central laws addressing Lake Sevan—the Law on Lake Sevan, the Overall and Annual Plans Law, and the Water Code—do not attempt to set forth a coherent, long-term water use program with specific project initiatives. The laws are large on planning and the establishment of ambitious regulatory frameworks, while they are weak in terms of specific targeted objectives. Despite aspirational provisions in the Lake Sevan Law, water withdrawal from the lake remains unregulated. The Water Code contains lofty provisions limiting the use of water resources to “conditions [for] their protection and restoration,”⁵⁰³ and prohibiting “disturbance to water protection zones.”⁵⁰⁴ However, the code sets no standards or criteria to delineate the appropriate “conditions” or identify what counts as “disturbance.” Even if such standards were added, the code contains no mechanism for enforcement. The Overall and Annual Plans Law is likewise bereft of specific programmatic details and enforcement procedures. While that law does incorporate Dr. Hovhannisyanyan's hypothesis that it is necessary to raise Lake Sevan's level by at least six meters,⁵⁰⁵ it sets forth no programs or policies for accomplishing the increase. Given the high profile of the LSAP and the NEAP and the participation of the Armenian Ministry of Nature Protection in their preparation, it is only reasonable to assume that those action programs influenced the Armenian National Assembly in its enactment of the Law on Lake Sevan. In addition, the USAID water management team in Armenia provided advice and assistance to the government in crafting the Water Code.⁵⁰⁶ Yet the Sevan Law and the Water Code only carry over the most broad objectives and regulatory structures of those program initiatives, rather than their specific action directives. The LSAP especially contained many worthwhile ideas could have been included in the Armenian laws. In enacting future laws and regulations regarding Sevan, the Armenian government should draw upon the specifics of the LSAP and other action studies.

There are, however, two action directives from the LSAP that have drawn the attention of the Armenian government. The LSAP's authors contended that raising the lake's water level depends upon completion of two unfinished projects: (1) construction of the Yeghvard reservoir, and (2) construction of the Vorotan tunnel.⁵⁰⁷ The Yeghvard reservoir project began in 1984.⁵⁰⁸ Its goal is

⁵⁰² See *What Happened to Lake Sevan?* *supra* note 4, at 4.

⁵⁰³ WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 15, art. 99, § 1.

⁵⁰⁴ *Id.* Ch. 15, art. 99, § 8.

⁵⁰⁵ LAW ON APPROVAL OF OVERALL AND ANNUAL PLANS OF RESTORATION, PRESERVATION, REPRODUCTION AND USAGE OF ECOSYSTEMS OF LAKE SEVAN, *supra* note 440, at art. 2.

⁵⁰⁶ See USAID, *Mission to Armenia: National Water Management Program*, *supra* note 335, at 2.

⁵⁰⁷ See LSAP, *supra* note 2, at xii, 15, 24, 30, 43.

⁵⁰⁸ *Id.* at 15.

to improve the nation's supply of water for agricultural irrigation, especially in the area of the Arzni-Shamiram canal.⁵⁰⁹ Estimates from the Armenian Water Design Institute suggest that the Yeghvard reservoir could reduce irrigation-related water releases from Lake Sevan by ninety-four cubic millimeters per year, resulting in a seven centimeter yearly increase in the lake's level.⁵¹⁰ Nevertheless, construction of the reservoir has been halted since 1989 due to insufficient funds.⁵¹¹ Recently, however, the Ministry of Nature Protection has cited completion of the Yeghvard reservoir as one of the government's priority projects to address the Sevan situation.⁵¹²

Second, the LSAP called for completion of a feasibility study for the Vorotan tunnel.⁵¹³ As early as the 1960s, the Soviets began to consider how to halt or even reverse the adverse effects on Lake Sevan from their water project. The Soviet plan was to stabilize the lake's water level by building a water tunnel.⁵¹⁴ In 1981, the Arpa-Sevan tunnel, designed to divert 250 million cubic meters of water per year from the Arpa River to Lake Sevan, was completed.⁵¹⁵ The addition of water from the Arpa River resulted in the lake level stabilizing at about 1,897 meters above sea level, roughly nineteen meters below its original level.⁵¹⁶ While the Arpa-Sevan tunnel has benefited Lake Sevan, it has fallen into disrepair and has leak problems.⁵¹⁷ Though the Armenian government has been slow to fund the Arpa-Sevan tunnel's repair, the government has gone beyond the LSAP's call for a feasibility study on a second diversion tunnel, the Vorotan. The tunnel was completed in April, 2004,⁵¹⁸ over twenty years after its construction began.⁵¹⁹ Already exhibiting flaws from over two decades of sporadic construction, the twenty-one kilometer tunnel⁵²⁰ is designed to divert up to 165 million cubic meters of water per year from the Vorotan River to Lake

⁵⁰⁹ *Id.*

⁵¹⁰ *Id.*

⁵¹¹ *Id.*

⁵¹² See *Political Issues Should Not Take Precedence Over Preservation of the Environment: UNDP's Information Officer, Aramazd Ghalamkaryan, interviews Armenia's Nature Protection Minister Vardan Ayyazyan*, available at http://www.undpi.am/bulletin/bul_22/2.html.

⁵¹³ See LSAP, *supra* note 2, at xii, 15.

⁵¹⁴ *Id.* at 7; *Lake Sevan, Features*, *supra* note 24.

⁵¹⁵ Minasyan, *supra* note 31, at 4.1; *What Happened to Lake Sevan?* *supra* note 4, at 3; LSAP, *supra* note 2, at 7; *Lake Sevan: The Sevan Problem*, *supra* note 5; *Lake Sevan, Features*, *supra* note 24.

⁵¹⁶ LSAP, *supra* note 2, at 7.

⁵¹⁷ See LSAP, *supra* note 2, at 15.

⁵¹⁸ See Minasyan, *supra* note 31, at 4.1.

⁵¹⁹ Minasyan, *supra* note 31, at 4.1; *Review and Evaluation of Completion of the Vorotan-Arpa Diversion Tunnel*, available at http://www.usaid.gov/am/new_energy/lcgp_app_vorotan_tunnel_ppt.pdf.

⁵²⁰ LAW ON APPROVAL OF OVERALL AND ANNUAL PLANS OF RESTORATION, PRESERVATION, REPRODUCTION AND USAGE OF ECOSYSTEMS OF LAKE SEVAN, *supra* note 440; *Review and Evaluation of Completion of the Vorotan-Arpa Diversion Tunnel*, *supra* note 522.

Sevan.⁵²¹ The tunnel was scheduled for final testing in October 2005, after which it is to begin diverting water to Sevan.⁵²²

The actions by the government of Armenia to achieve full project completion of both the Yeghvard reservoir and the Vorotan tunnel mark significant steps in the government's commitment to restoring the Sevan ecosystem. Rehabilitation of the Arpa-Sevan tunnel should also become a priority. All three projects are critical to raising the lake's water level, which is necessary for its restoration and preservation. As suggested in the LSAP, these are the most feasible and certain measures to improve the lake's water balance.⁵²³

Another consideration pertinent to Lake Sevan's water quantity is the loss of water through leaks in outdated irrigation systems and water supply networks. To date, Armenian environmental laws have not adequately addressed these concerns, even though associated water losses are substantial. The 1999 Human Development Report in Armenia noted that, "[a]pproximately half of the water used for irrigation is lost to deteriorated irrigation networks. Losses of drinking water in the water-supply networks amount to 65 percent."⁵²⁴ Moreover, Armenia's existing network of monitoring stations that measure inflow and outflow from the lake and collect other limnological data is inadequate.⁵²⁵

Finally, the Armenian laws are marked by problems of regulatory instability and a lack of transparency.⁵²⁶ For example, stakeholder groups do not have the opportunity to participate in the processes of decision-making that involve water quantity.⁵²⁷ None of the relevant Armenian laws substantially address these causes of Sevan's water quantity problems.

C. Water Quality

In addition to strengthening how they address Lake Sevan's water quantity problem, the Armenian laws must pay greater attention to improving the water quality of the lake. The Law on Lake Sevan, the Overall and Annual Plans Law, and the Water Code each contain provisions related to water quality.⁵²⁸ Yet like

⁵²¹ See *Review and Evaluation of Completion of the Vorotan-Arpa Diversion Tunnel*, *supra* note 522; Minasyan, *supra* note 31, at 4.1.

⁵²² See *Vorotan-Arpa Tunnel to be Tested Soon*, available at <http://armeniadiaspora.com/js/031021tunnel.html>.

⁵²³ See LSAP, *supra* note 2, at 14-15.

⁵²⁴ *Human Development Report Armenia 1999*, available at

<http://www.undp.am/publications/nhdr99/eng/4-6.php>. Accord Greens Union, *supra* note 15, at 7-8.

⁵²⁵ Anne Shrinian-Orlando, *supra* note 388.

⁵²⁶ See Ruth Greenspan Bell, *Legitimacy, Trust, and the Environmental Agenda: Lessons from Armenia*, 30 ENVTL L. REP. 10771, 10772-74 (2000).

⁵²⁷ This is a concern that had been raised in the LSAP, but not adequately addressed in the *Law on Lake Sevan*; see LSAP, *supra* note 2, at 14.

⁵²⁸ See, e.g., L. ON LAKE SEVAN, *supra* note 392, at Ch. 2, art. 7 (describing the guiding principle for the central Sevan regulatory zone as "protect[ing] and restor[ing] the natural state of the Lake Sevan ecosystem – water quality, natural landscape and biodiversity of the lake and the land areas

with water quantity, the trio of laws take on Sevan's water quality problems only in a general way, not by setting forth specific, targeted, and enforceable rules. The overall weakness of the Armenian laws in addressing Lake Sevan's water quality problems becomes readily visible when considering certain specific recommendations made in the LSAP that were ultimately rejected or ignored by the Armenian lawmakers. For one, the LSAP highlights the need for money to support ecologically-friendly farming and watershed management that would reduce agricultural discharge from farms in the Sevan basin.⁵²⁹ This endorsement of "Good Agricultural Practices"⁵³⁰ was a sound and important recommendation that deserved formal inclusion in the Armenian legal framework.

It is equally critical to improve the water quality monitoring which the Armenian government has undertaken. The LSAP observed that, "Because monitoring activities have been halted due to lack of resources, it is difficult to estimate the exact amount of pollution discharges."⁵³¹ While the Armenian laws speak generally in terms of initiating monitoring programs,⁵³² the statutory language to date is merely rhetorical. The laws contain neither specified pollution control standards nor regulatory enforcement mechanisms. Yet the severity of the pollution problems in Lake Sevan demand meaningful standards aggressively enforced.

Poor farming practices have led to substantial pesticide and fertilizer run-off into the lake.⁵³³ There is also a great deal of nutrient run-off from animal wastes.⁵³⁴ Agricultural activities are considered to be the single greatest source of pollutants entering the Sevan basin.⁵³⁵ Over thirty percent of the lake's phosphorus load and roughly seventy percent of its nitrogen load are thought to come from agriculture.⁵³⁶ Nevertheless, as the LSAP noted, "No laws exist... concerning the manufacture, distribution, or use of pesticides or products containing heavy metals."⁵³⁷ This observation remains true today even after passage of the Lake Sevan Law, the Overall and Annual Plans Law, and the Water Code. Serious improvement of the water quality of Lake Sevan will always be difficult to attain so long as agricultural pollutant discharges remain relatively unregulated.

near the shore"); WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 8 (calling for the establishment of water quality standards).

⁵²⁹ See LSAP, *supra* note 2, at 33.

⁵³⁰ *Id.*

⁵³¹ *Id.* at 16.

⁵³² See, e.g., WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 3, art 16.

⁵³³ See LSAP, *supra* note 2, at 16.

⁵³⁴ *Id.* at 16-17.

⁵³⁵ *Id.* at 8.

⁵³⁶ *Id.*

⁵³⁷ *Id.* at 17.

The LSAP further notes that wastewater treatment facilities in the Sevan basin are in terrible disrepair.⁵³⁸ Nearly all wastewater from the towns and communities surrounding the lake is discharged into the lake without treatment.⁵³⁹ Most of the people who live in the lake's immediate vicinity are farmers who tend to allow both domestic and animal wastes to flow directly into the lake or its tributaries.⁵⁴⁰ This practice has devastating effects on the lake ecosystem and demands that immediate attention be given to domestic wastewater treatment. For example, the LSAP reports that "a broken sewer pipeline originating from the town of Jermuk alone is believed to contribute about twelve percent of phosphorus and about two percent of the total nitrogen load" flowing into Lake Sevan.⁵⁴¹ Yet as the LSAP does not regard waste runoff as a priority, nor do the Armenian environmental laws provide meaningful recourse. The LSAP placed construction of a new sewer pipeline for Jermuk on its lowest priority level.⁵⁴² And while the Law on Lake Sevan, the Overall and Annual Plans Law, and the Water Code all contain general prohibitions of pollutant discharges,⁵⁴³ their regulatory frameworks are bereft of any strict monitoring and enforcement mechanisms for addressing wastewater discharges. Unless and until wastewater discharges are addressed seriously in Armenian environmental laws, substantial reduction in the pollutant load in Lake Sevan from wastewater sources is unlikely.

The Armenian environmental law framework also inadequately addresses industrial pollution. Roughly fifty industrial and municipal plants in the Sevan basin release between 40,000 to 60,000 cubic meters of wastewater into the lake each day.⁵⁴⁴ This exceeds by at least fourfold the capacity of the eighteen biological refinement or preliminary purification stations in the lake basin.⁵⁴⁵ The Lake Sevan Law unequivocally prohibits this introduction of toxic or otherwise dangerous substances into the Sevan ecosystem.⁵⁴⁶ The Water Code declares that water resources such as Sevan should be protected from pollutants, including radioactive and toxic wastes.⁵⁴⁷ Yet Armenia's programs to combat industrial pollution have historically been largely ineffectual because they are

⁵³⁸ See *id.* at 8, 32.

⁵³⁹ *Id.*

⁵⁴⁰ *Id.*

⁵⁴¹ *Id.* at 8.

⁵⁴² See *id.* at 32.

⁵⁴³ See, e.g., L. ON LAKE SEVAN, *supra* note 392, at Ch. 7; L. ON APPROVAL OF OVERALL AND ANNUAL PLANS OF RESTORATION, PRESERVATION, REPRODUCTION AND USAGE OF ECOSYSTEMS OF LAKE SEVAN, *supra* note 440, at art. 2; WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 8.

⁵⁴⁴ R. Hovhannisyan, *supra* note 54, at 31.

⁵⁴⁵ See *id.*

⁵⁴⁶ See L. ON LAKE SEVAN, *supra* note 392, at Ch. 7, art. 28.

⁵⁴⁷ See WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 448, at Ch. 15, art. 99.

rarely enforced and fines are not issued.⁵⁴⁸ As noted in the LSAP, this is attributable to the poor structure of the regulatory program:

This is partly due to the unrealistic norms and regulations currently in place in Armenia. Industrial polluters do not try to comply with the norms and the regulatory staff knows that it is not feasible for local governments or enterprises to comply. Rules for plant closure are unclear regarding who has authority to decide such a penalty and under what circumstances. As a consequence this sanction has not been applied for several years.⁵⁴⁹

The legislative framework since enactment of the Sevan laws and the Water Code has changed, but until it becomes clear that the regulatory and enforcement mindset have followed suit, the general prohibitions in the laws against introduction of industrial pollutants into Lake Sevan will likely have little impact.

Several other Sevan watershed issues are not adequately addressed in the Armenian laws. For example, the Lake Sevan Law articulates only the most general reference to the need to reforest the mountain slopes surrounding the lake.⁵⁵⁰ Heavy timber harvesting has left many of the slopes largely denuded, resulting in frequent landslides and flooding. The landslides topple trees, which are carried along with soil, mud, and rocks into the lake. The result is a significant and harmful increase in the lake's nutrient load. In order to counteract this harmful legacy of unregulated timber harvesting, anti-erosion measures and revegetation of the mountain slopes is necessary throughout the Sevan basin.

Another negative influence on the water quality of Lake Sevan comes from the substantial solid waste problem in the basin. The basin towns of Vardenis, Martuni, Gavar, and Sevan cooperatively operate five solid waste sites occupying an area of roughly eighteen hectares.⁵⁵¹ These sites receive an estimated 85,000 cubic meters of waste yearly and currently contain about three million cubic meters of waste.⁵⁵² Several other solid waste sites exist in the Sevan basin.⁵⁵³ Not only are these sites criticized for poor site selection and inadequate waste disposal methods, the amount of solid waste they hold is unknown given sloppy record keeping.⁵⁵⁴ Given that rainfall carries toxins from

⁵⁴⁸ See DARBINYAN & ASHIKYAN, THE ROLE OF ENVIRONMENTAL ENFORCEMENT IN THE REPUBLIC OF ARMENIA: STEPS TOWARD SUSTAINABLE DEVELOPMENT, *supra* note 225, at 135.

⁵⁴⁹ See LSAP, *supra* note 2, at 16.

⁵⁵⁰ L. ON LAKE SEVAN, *supra* note 392, at Ch. 7, art. 29.

⁵⁵¹ See LSAP, *supra* note 2, at 8.

⁵⁵² *Id.*

⁵⁵³ *Id.* at 9 (observing that several legal and illegal solid waste dumps exist near population centers in Sevan basin).

⁵⁵⁴ *Id.*

these waste sites into the Sevan basin's surface waters, enforceable standards must be forthcoming to address this means of Sevan ecosystem degradation.

The Armenian legal framework for Lake Sevan falls short in confronting the lake's water quality problems despite, and perhaps partly because of, general provisions of the Law on Lake Sevan and the Water Code that are strict and uncompromising. For example, the Lake Sevan Law stipulates that "any type of activity in the central, direct impact and indirect impact zones that has damaging impact on the Lake Sevan ecosystem is prohibited."⁵⁵⁵ And as noted earlier,⁵⁵⁶ the Water Code establishes an outright prohibition on wastewater discharges into the lake.⁵⁵⁷

Under the code, Lake Sevan qualifies as a "national monument" and a "natural preserve,"⁵⁵⁸ thereby according it "specially protected water resource" status which includes an absolute prohibition on untreated discharges of wastewater and drainage water.⁵⁵⁹ Additionally, the Lake Sevan Law establishes a general policy prohibiting "[a]ny type of activity... that has a dangerous impact on [the] Lake Sevan ecosystem."⁵⁶⁰ Such unbending rules only make future enforcement unrealistic. The Sevan basin is home to 270,000 people. Most domestic, agricultural, and industrial wastes generated by this population are currently discharged into Sevan.⁵⁶¹ Solid waste landfills in the basin are characterized by poor site location and inadequate waste disposal methods. Improving this ecologically unhealthy situation is critical. Yet environmental improvement by way of legal initiative requires more than the passage of laws and enactment of regulations. Such improvement happens only when the laws and regulations are implemented and adequately enforced, which itself is only possible with laws that are realistic and enforceable. Categorical statements and outright prohibitions such as those found in the Lake Sevan Law and the Water Code are unrealistic and unenforceable. Given the state of the wastewater treatment facilities in the Sevan basin, for example, nearly all of the resident population's domestic, industrial, and agricultural activities are technically prohibited under the new legal framework. Likewise, airborne emissions from chemical facilities in the Ararat Valley and from a thermoelectric power plant in the town of Hrazdan spread to and pollute Lake Sevan and in doing so, violate the Lake Sevan laws.⁵⁶² Addressing the lake's water quality problems is essential. However, these unqualified prohibitions, while desirable in theory, are so far removed from the existing reality they make

⁵⁵⁵ L. ON LAKE SEVAN, *supra* note 392, at Ch. 2, art. 10.

⁵⁵⁶ See *supra* text accompanying notes 474-77.

⁵⁵⁷ WATER CODE OF THE REPUBLIC OF ARMENIA, *supra* note 462, at Ch. 15, art. 4.

⁵⁵⁸ *Id.* at Ch. 15, art. 105.

⁵⁵⁹ *Id.* at Ch. 15, art. 104.

⁵⁶⁰ L. ON LAKE SEVAN, *supra* note 392, at Ch. 2, art. 10.

⁵⁶¹ See LSAP, *supra* note 2, at 8.

⁵⁶² See *id.* at 6-7; Anne Shrinian-Orlando, *supra* note 388.

nearly everyone in the basin a scofflaw,⁵⁶³ thereby discouraging, rather than encouraging, environmental responsibility and cooperation.

D. Management Issues

Recommendations and plans for improvement of Lake Sevan's ecosystem need good management and sound implementation. Legislative acts, even if well written, are only effective when enforced. Environmental legal enforcement is a problem in Armenia, where little faith is placed in the legitimacy of law.⁵⁶⁴

Lack of human resources is a primary reason for the loose enforcement of environmental law in Armenia.⁵⁶⁵ Meaningful enforcement of environmental rules and regulations depends in large part on regular monitoring and inspection. In Armenia, the State Environment Inspectorate and its regional offices are isolated. The Inspectorate, which is a department within the Ministry of Nature Protection, is characterized by a staff with little environmental knowledge, a lack of job training, inadequate equipment, and unfamiliarity with national policies and management objectives.⁵⁶⁶ As suggested by others, increasing job training for inspectors, attracting trained and highly experienced specialists, and improving the coordination of responsibilities between the Inspectorate and other relevant institutions could drastically improve the situation.⁵⁶⁷

Effective management and implementation of environmental legislation further requires clarity and consistency in the laws themselves. The Armenian environmental laws, however, are replete with contradictions and confusions. For example, the Lake Sevan Law states that the property falling within the lake's transitional zones, which reach 150 meters in width in some places, are inalienable properties of the Armenian Government.⁵⁶⁸ Ownership is unclear, however, over the remainder of Sevan National Park which stretches outward from the lake several kilometers. As a result, there is ambiguity regarding ownership of various lands, including mountain slopes, roadways, and inhabited inholdings that fall within the nominal boundaries of Sevan National Park, an ambiguity that some suspect is not accidental.⁵⁶⁹ The status of Sevan National Park has undergone a series of changes in recent years. In 2000, the park was classified as a government-owned, closed shareholding company.⁵⁷⁰ In 2001, it was reclassified as a non-commercial organization.⁵⁷¹ The supposition of the

⁵⁶³ Shrinian-Orlando, *supra* note 388.

⁵⁶⁴ See Bell, *supra* note 529, at 10772-75.

⁵⁶⁵ *Id.* at 10775.

⁵⁶⁶ See See DARBINYAN & ASHIKYAN, THE ROLE OF ENVIRONMENTAL ENFORCEMENT IN THE REPUBLIC OF ARMENIA: STEPS TOWARD SUSTAINABLE DEVELOPMENT, *supra* note 225, at 135.

⁵⁶⁷ See *id.*

⁵⁶⁸ See L. ON LAKE SEVAN, *supra* note 392, at Ch. 1, art. 4.

⁵⁶⁹ See Anne Shrinian-Orlando, *supra* note 388.

⁵⁷⁰ *Id.*

⁵⁷¹ See *id.*

Greens Union of Armenia, a prominent Armenian NGO, is that the government is gradually removing Sevan National Park from its budget of financial responsibilities.⁵⁷² The ambiguous ownership status of much of the park is significant, for the less land within the park's boundaries the government owns, the fewer financial obligations it incurs, thereby easing the park's transition out of the national budget, should that be the government's objective.

A lack of clarity also characterizes the organizational and regulatory responsibilities that the Lake Sevan Law assigns to the lake's Experts Commission and the Ministry of Nature Protection. The LSAP had proposed an experts commission for Lake Sevan which was to be composed of political appointees serving under the Prime Minister.⁵⁷³ The Law on Lake Sevan rejected this politically structured commission in favor of one made up of scientists working under the auspices of the Armenian National Academy of Sciences.⁵⁷⁴ While this choice of a scientific rather than a political commission marks an improvement, the responsibilities assigned the commissioners seem highly ambitious, including conducting environmental assessments, gathering data, performing research, deriving recommendations and conclusions from the data and assessments, and crafting the required Overall and Annual Plans for the Sevan ecosystem.⁵⁷⁵

The Law on Lake Sevan makes no express mention of the Ministry of Nature Protection. It does, however, assign general oversight and regulatory "supervision over the implementation of the requirements of [the] Law" to an unspecified "state management body,"⁵⁷⁶ presumably the Ministry of Nature Protection. At the same time, the Lake Sevan Law entrusts to the Experts Commission the responsibility to draft the Overall and Annual Plans that form the principal regulatory mechanisms for the law's implementation.⁵⁷⁷ This appears to create an unclear regulatory structure, raising the possibility that the Experts Commission and the Ministry of Nature Protection could each claim final authority over management and restoration decisions concerning Sevan. The Law on Approval of Overall and Annual Plans for Lake Sevan exacerbates this concern by providing:

The Ministry of Nature Protection, as a government sanctioned body in the sphere of nature protection, will be responsible for the Plan's implementation. The monitoring of the Plan's implementation will also be assigned to the Ministry of Nature Protection. The independent assessments of Plans and professional studies/assessments will be carried out by the Commission on Lake Sevan. The oversight on the

⁵⁷² *Id.*

⁵⁷³ See LSAP, *supra* note 2, at 26.

⁵⁷⁴ See L. ON LAKE SEVAN, *supra* note 392, at Ch. 5, art. 19.

⁵⁷⁵ See *id.* at Ch. 5, art. 20-21.

⁵⁷⁶ *Id.* at Ch. 4, art. 15.

⁵⁷⁷ *Id.* at Ch. 5.

implementation of Overall and Annual Plans will be carried out by the National Assembly.⁵⁷⁸

It thus appears that while the Experts Commission is responsible for crafting the Overall and Annual Plans that serve as the main devices for implementing the Law on Lake Sevan, the Ministry of Nature Protection is held as the primary entity responsible for the law's implementation, insofar as it is charged with supervising how the Sevan Law is implemented⁵⁷⁹ and for overseeing implementation and monitoring of the Overall and Annual Plans.⁵⁸⁰ This creates a recipe for conflict between the two regulatory bodies. Moreover, the dual responsibilities assigned the Ministry of Nature Protection to take responsibility for implementing the Overall and Annual Plans and then monitoring that implementation leads to an enforcement conflict that raises the prospect of governmental manipulation of the Overall and Annual Plans. Those plans have been rightly described as the regulatory device that will "determine the future of Lake Sevan and its basin."⁵⁸¹ Hence, their importance as meaningfully implemented plans crafted on the basis of science—not politics—cannot be overstated. Placing their design and enforcement ambiguously in the hands of two regulatory bodies only increases uncertainty over the effectiveness of the overall Sevan regulatory program.

E. Environmental Impact Assessment

As noted previously,⁵⁸² in 1995 Armenia joined many other nations that have adopted ambitious laws requiring Environmental Impact Assessments (EIAs) for certain projects.⁵⁸³ Following the lead of the United States, the EIA process has advanced rapidly as a means of assuring the environment's due consideration in development. EIA requirements aim to cajole proponents of activities that impact the environment to consider the extent of those impacts and whether alternatives exist. Armenia's EIA law, the Law on Environmental Impact Expertise (EIE), identifies a long list of activities where environmental impacts must be considered before construction approval is granted.⁵⁸⁴ Yet the government devotes only very limited financial resources and a very small staff to oversee and manage its EIA program.⁵⁸⁵ The EIE law and those assigned to

⁵⁷⁸ L. ON APPROVAL OF OVERALL AND ANNUAL PLANS OF RESTORATION, PRESERVATION, REPRODUCTION AND USAGE OF ECOSYSTEMS OF LAKE SEVAN, *supra* note 440, at Ch. 7.

⁵⁷⁹ L. ON LAKE SEVAN, *supra* note 392, at Ch. 4, art. 15.

⁵⁸⁰ L. ON APPROVAL OF OVERALL AND ANNUAL PLANS OF RESTORATION, PRESERVATION, REPRODUCTION AND USAGE OF ECOSYSTEMS OF LAKE SEVAN, *supra* note 440, at Ch. 7.

⁵⁸¹ See Anne Shrinian-Orlando, *supra* note 388.

⁵⁸² See *supra* text accompanying note 261.

⁵⁸³ See L. ON ENVTL. IMPACT EXPERTISE, *supra* note 262, at art. 2.

⁵⁸⁴ See text accompanying notes 268-73, *supra*.

⁵⁸⁵ See Bell, *supra* note 592, at 10775; Viktoria Ter-Nikoghosyan and Narine Karamian, *Armenian Bottleneck: Building Authorities and Public Groups Capacities for Environmental Enforcement*, in PROCEEDINGS OF THE FIFTH INTERNATIONAL CONFERENCE ON ENVIRONMENTAL COMPLIANCE AND

implement it are thus relatively powerless and will likely remain so until a stronger national economy stimulates greater governmental support. As it stands, the Armenian EIA law is no more than symbolic.

Most development projects in Armenia do not follow the country's EIA procedures.⁵⁸⁶ The outdated environmental decision making methods and mindset used in the former Soviet Union is still often followed instead.⁵⁸⁷ Furthermore, sound procedures are lacking for public participation in the EIA process and in environmental decision making more generally.⁵⁸⁸ Namely, there is minimal public access to environmental information.⁵⁸⁹ Thus, while the framework of recent laws concerning the protection and restoration of Lake Sevan (the Law on Lake Sevan, the Overall and Annual Plans Law, and the Water Code) call for public involvement and compliance with the country's EIA Law,⁵⁹⁰ until that law itself becomes more potent and consistently applied, the EIA mechanism will provide little public oversight and input into the government's management of the Sevan ecosystem.⁵⁹¹

F. Public Participation and NGO Involvement in Environmental Decision Making

This final section considers the opportunities for individuals, citizens, and NGOs in Armenia to participate in Lake Sevan's restoration under the country's current legal framework. During the Soviet era, as the result of secretiveness and "the lack of objective information" on environmental issues,⁵⁹² the Armenian public was neither active in expressing its concern for the environment nor in pressuring lawmakers to be environmentally responsible.⁵⁹³ During the Soviet era, the public's concerns regarding the environment were primarily conveyed through "letters to Party and government officials"⁵⁹⁴ or by

ENFORCEMENT 91 (1998), available at <http://www.inece.org/publicationlist.html>.

⁵⁸⁶ An analysis of EIAs in Armenia during 1996-1999 revealed that 93% of approved projects did not pass through public hearings. In some cases, scoping and screening procedures were not fully followed and the monitoring was neglected. M. VARDANYAN, FIVE YEARS WITH ENVIRONMENTAL IMPACT ASSESSMENT IN ARMENIA: PROBLEMS AND ACTIONS (2000).

⁵⁸⁷ Bell, *supra* note 529, at 10772-75.

⁵⁸⁸ See Ter-Nikoghosyan and Karamian, *Armenian Bottleneck*, *supra* note 588, at 94.

⁵⁸⁹ See *id.*

⁵⁹⁰ See, e.g., L. ON LAKE SEVAN, *supra* note 392, at Ch. 6, art. 24.

⁵⁹¹ See Bell, *supra* note 529, at 10775. It should be noted, however, that recently, some positive trends have appeared regarding implementation of the EIE Law in Armenia. The University of Economy and Yerevan State University both began offering courses on the EIA process. The First National Conference on EIA, with participants from central and regional governmental agencies, NGOs, and academic organizations took place in 1999. Moreover, the first guidelines on public participation in the EIA process were published in the year 2000. See VARDANYA, *supra* note 261, at 17.

⁵⁹² VARDANYA, *supra* note 261, at 17.

⁵⁹³ See Bell, *supra* note 529, at 10774.

⁵⁹⁴ ZIEGLER, ENVIRONMENTAL POLICY IN THE U.S.S.R., *supra* note 121, at 37.

letters to major periodicals such as *Pravda* and *Izvestiya*.⁵⁹⁵ The Soviet policy-making process excluded both the public and independent groups from participating in environmental decision-making.⁵⁹⁶ Policies were made with the Communist ideology in mind and under the watchful eye of the Communist Party.⁵⁹⁷

Armenia, like most other former Soviet republics, accordingly does not have a history of individuals or interest groups who played significant roles in developing environmental objectives.⁵⁹⁸ Environmental protection for the Soviets was the bailiwick of experts and government officials.⁵⁹⁹ Important decisions were made clear of public scrutiny,⁶⁰⁰ as environmental laws and policies were formulated according to ideological, not scientific criteria.⁶⁰¹ In the words of one commentator, "Personalities, negotiations between government ministries, and bureaucratic or party decisions had more to do with the actual level of environmental control than did the laws."⁶⁰²

Today, in a country like Armenia, the post-Soviet understanding of how to craft successful laws remains different from the Western model.⁶⁰³ Environmentalists in the former Soviet republics put substantial faith in science. But while scientific awareness is necessary, few environmental solutions rest solely on science. Rather, policy considerations are paramount in these countries' governance, often eclipsing scientific analysis. Questions of economic or social policy, such as whether the country has the economic resources or wherewithal to carry out certain environmental goals, or whether its social institutions are adequate to facilitate implementation of environmentally desirable laws, often become more determinative than science alone.

In Armenia, whether to rely on the judicial system to rectify problems, including those of environmental despoliation, is a fundamental policy consideration.⁶⁰⁴ The Armenian people tend to avoid judicial intervention because the country's legal process is weak and ineffective.⁶⁰⁵ Its nascent court system is, in the words of one prominent judge, "far from being able to fulfill its role as guarantor of law and justice in society."⁶⁰⁶ It is unlikely, therefore, that

⁵⁹⁵ See ROBERT SHARLET, *THE NEW SOVIET CONSTITUTION* (1978).

⁵⁹⁶ See Bell, *supra* note 529, at 10774.

⁵⁹⁷ ZIEGLER, *ENVIRONMENTAL POLICY IN THE U.S.S.R.*, *supra* note 121, at 4.

⁵⁹⁸ Bell, *supra* note 529, at 10774.

⁵⁹⁹ See *id.*

⁶⁰⁰ *Id.*

⁶⁰¹ See, e.g., WEINER, *A LITTLE CORNER OF FREEDOM*, *supra* note 189, at 414-28; WEINER, *MODELS OF NATURE*, *supra* note 172, at 121-61; PRYDE, *ENVIRONMENTAL MANAGEMENT IN THE SOVIET UNION*, *supra* note 168, at 82-83; Jancar, *supra* note 189, at 174.

⁶⁰² Bell, *supra* note 529, at 10774.

⁶⁰³ See *id.*

⁶⁰⁴ See *id.* at 10773.

⁶⁰⁵ *Id.*

⁶⁰⁶ HOVHANNES MANUKYAN, *JUDICIAL AND LEGAL REFORM IN THE REPUBLIC OF ARMENIA: PROGRESS, CHALLENGES, AND LESSONS LEARNED* 7 (2001). Judge Hovhannes is the Chair of the Commercial Court of Appeal of the Republic of Armenia. *Id.* at 2.

the people of Armenia will turn to the courts as a forum to pressure the government for strict enforcement of environmental laws.

Nevertheless, the public retains a very important role in Armenia with respect to enforcement of environmental legislation. Community involvement and public participation could be instrumental in helping the government build a foundation for an effective environmental regulatory regime. Indeed, regulatory enforcement is one example of a particularly significant role the public could assume in Armenia's environmental regulatory framework. Typically, environmental enforcement occurs through officials who conduct inspections and bring violators to justice. However, in Armenia, many factors obstruct such a process. Environmental enforcement officials lack vehicles or other equipment to visit and monitor sites.⁶⁰⁷ Inspectors are usually not independent and are powerless against indifferent government officials and influential individuals who control the very industries the inspectors are charged to investigate.⁶⁰⁸ Often, the inspectors are not allowed access to encroaching industrial facilities without giving prior notice.⁶⁰⁹ Most environmental inspectors in Armenia are poorly paid and thus there is a history of their bribery.⁶¹⁰

Opportunity is thus ripe in Armenia for the country's well-organized and growing network of grass-roots and community organizations to assume a role in the country's environmental enforcement.⁶¹¹ NGOs are potentially more effective than the government in identifying violators of the country's environmental laws. NGOs could employ inspection techniques that are less labor intensive and bureaucratically cumbersome than those currently used. Instead of collecting information that will only be filed away in government archives, NGOs can use the information they gather as the basis for public campaigns to pressure environmental violators into compliance. This public procedure could well be more successful than standard government enforcement mechanisms in reducing pollution in Armenia generally, and at Lake Sevan in particular.⁶¹²

Finally, it is critical to note the importance of native language in Armenia. Armenia is a small country with its own national language, which has a distinct thirty-nine-character alphabet.⁶¹³ Nearly all Armenians use Armenian as their first language. Russian is prevalent as the most common second language, while a small but growing percentage of the population speaks and reads English or other popular European languages. It is thus critical that all information regarding Lake Sevan be available in Armenian. Action plans, programs,

⁶⁰⁷ See Bell, *supra* note 529, at 10774.

⁶⁰⁸ *Id.* at 10775.

⁶⁰⁹ *Id.*

⁶¹⁰ *Id.*

⁶¹¹ See *id.* at 10775-76.

⁶¹² See *id.*

⁶¹³ See, e.g., <http://www.omniglot.com/writing/armenian.htm>.

studies, or papers prepared by or with the help of international experts or organizations must be translated into Armenian in order to facilitate greater public understanding of environmental developments. Unfortunately, these translations have not been done. Documents such as the LSAP and NEAP, prepared with the support of the World Bank, were only published in English. Making such materials available in the Armenian language is imperative for meaningful public awareness and participation. Active creative involvement by Armenian experts in program development will in turn help create planning documents, such as an updated LSAP, that more broadly reflect the interests, concerns, and perspectives of the Armenian people. It is unlikely that documents that the Armenian people are unable to understand will carry much influence over their attitudes or activities regarding Lake Sevan.

CONCLUSION

Ecological devastation is one of the most unfortunate legacies the old millennium passed on to the new. Across the globe, people and nations are attempting to address countless years of industrial and technological indifference to the earth. Yet few countries in the world have been so markedly impacted by a single environmental blunder as has Armenia through the desiccation of Lake Sevan. The lake's prominence in the history and culture of the country, and its importance for the country's current social, economic, and ecological well-being makes its restoration Armenia's most pressing environmental concern.

Yet the prospects for restoration under the current legal framework are modest at best. Review of the limnological and hydrological problems that beset the lake has shown that the current lake condition remains far removed and dramatically impoverished from its natural state, prior to the water level lowering.⁶¹⁴ The newly independent Republic of Armenia, with the assistance of certain players in the international environmental community, has taken important steps toward reversing the lake's eutrophic status and rehabilitating its once abundant diversity of wildlife. Yet those steps, though encouraging, fall far short of what is needed. Scientific studies have suggested that Lake Sevan's water level must be raised at least six meters to stem its eutrophication,⁶¹⁵ and negative anthropogenic influences to the lake's water quality must dramatically decline. The legislation enacted by the Government of Armenia, especially the Law on Lake Sevan and the Water Code, is encouraging and in certain respects insightful; yet the lack of specificity in these laws and the absence of meaningful monitoring and enforcement procedures minimize their restorative impact and make them little more than symbolic gestures.

⁶¹⁴ See *supra* text accompanying notes 27-144.

⁶¹⁵ See *supra* text accompanying notes 146-53.

Stronger legal provisions are imperative. The Lake Sevan Law should be amended, and the next rendition of the Law on Approval of Overall and Annual Plans must be strengthened. Strict pollution control measures must be adopted and enforced. Critical projects such as the Vorotan tunnel and Yeghvard reservoir must be completed and fully operational, and the Arpa-Sevan tunnel repaired. For only through such projects designed to raise the lake's level, combined with serious measures to improve the lake's water quality, can any real restoration of Lake Sevan be expected. And only through the restoration of the lake can the people of Armenia hope to once again have the opportunity to truly enjoy their glimmering piece of fallen blue sky.

